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Original Communications

THE SIGNIFICANCE OF ANTERIOR PITUITARY HORMONE IN THE BLOOD OF GYNECOLOGIC PATIENTS*

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THE advances of the past few years in our knowledge of the hormones concerned with the function of the female sex organs have paved the way to a new method of approach in dealing with the functional diseases of these structures. Although it is impossible at the present to estimate to what extent this will prove of clinical value and to what degree these findings will be applicable to our anatomic knowledge, it is very necessary to obtain as soon as possible a large number of observations from this new standpoint.

The recent investigations which have been carried out on the female sex hormones have been directed along three main lines of inquiry—the anterior lobe of the hypophysis, the ovarian follicular hormone, and the corpus luteum hormone—and these have unfortunately been kept so distinct that it is difficult to coordinate them and appreciate their full value. The diagram† (Fig. 1) (based on the experimental work of Evans, Smith, Engle, Aschheim, Zondek, Allen, Doisy, Frank, Loeb, Loewe, Parkes, Corner, Hisaw, and numerous others) is an attempt to represent the most salient features of the problem and illustrate the interaction of these important factors. It of course only seeks to explain a few fundamental facts which are fairly well proved,

*Read at a meeting of the San Francisco County Medical Society, March 11th, 1930.

†Since this paper was written a similar but more elaborate diagram by Zondek (Klin. Wchnschr. 9: 245, 1930) has appeared.

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

and necessarily leaves out much that not only is important but requires further elucidation.

It is seen that from the anterior hypophysis originate three hormones, or at least, the substance of this gland can produce three distinct effects, and of prime interest to us are those two which directly affect the ovary. In the first place we find the influence of the anterior

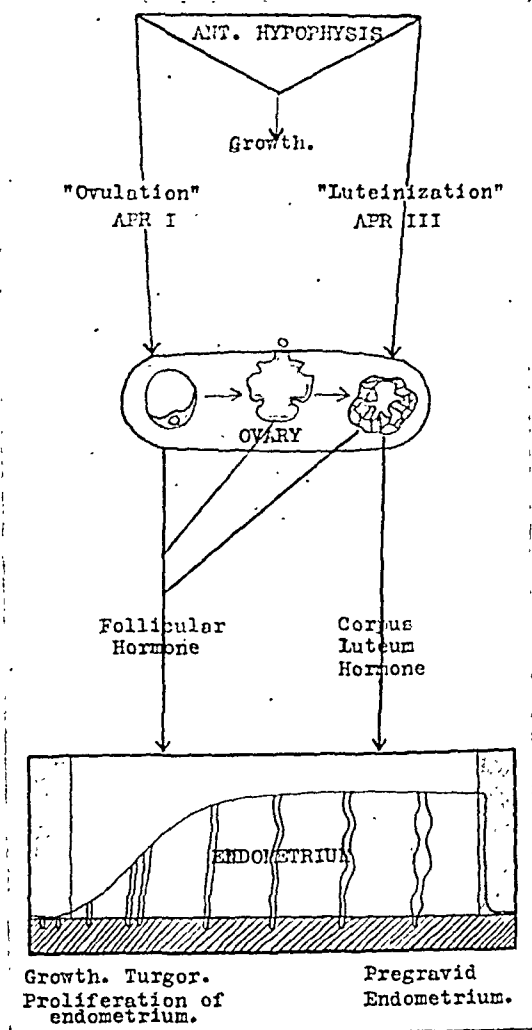


Fig. 1.—Diagram illustrating the interaction of the important hormones concerned with menstruation and pregnancy. (The representation of the endometrium is after R. Schroeder.)

pituitary "ovulation hormone" in the development of a graafian follicle in the ovary and the consequent elaboration of the "follicular hormone" which in turn stimulates the uterus to growth, turgor, and the proliferation of the basal layers of the endometrium. The second anterior pituitary factor coming into play then causes a "luteinization" of the cells of the ruptured follicle and the formation of a second

ovarian (corpus luteum) hormone which acts on the endometrium to produce the changes characteristic of the premenstrual phase, or in the case of gestation, to decidual transformation.

If this theory should prove correct it is readily seen how any disturbance altering the function of one or more of these hormones may manifest itself by serious pelvic disorders. The possibility is well illustrated by the anatomic findings in conditions such as glandular hyperplasia endometrii and the clinical history of menstrual irregularities accompanying hypo- and hyperpituitary dysfunctions. It would seem of vital importance, therefore, as Zondek¹ has emphasized in a recent article, to make "functional" as well as "anatomical" studies of our patients on the basis of these discoveries. A simple method of partly accomplishing this has been found in the determination of the presence of large amounts of these hormones in the blood, urine or tissues of women with certain pelvic disorders. Valuable contributions on the demonstration of follicular hormone in various normal and abnormal conditions have already appeared (Frank and Goldberger, Loewe, Aschheim and Zondek, Siebke, and others), and although little is known as to the corpus luteum hormone it would seem as though this information may be forthcoming before long. The development of a test for the presence of the anterior pituitary hormone (or hormones) by Aschheim and Zondek has led to an important biologic reaction for the diagnosis of pregnancy. It is possible, however, that a different interpretation of this procedure may enable it to be used for the study of certain pelvic diseases, and the present study is directed to the analysis of some observations on this question.

TECHNIC

The technic of the test used in this study has been described in two previous communications (Fluhmann^{2,3}), and is based on the "pregnancy test" of Aschheim and Zondek.⁴ It consists in obtaining, under sterile precautions, from 15 to 20 c.c. of venous blood from the patient to be examined. This is then allowed to stand or is centrifuged and from 3.0 to 5.0 c.c. of the clear serum are injected subcutaneously, twice daily in from 0.5 to 1.0 c.c. doses, into an immature female white mouse. (In view of the study by Engle and Rosasco⁵ the immaturity is determined by the age and not by the weight of the mice, and they are used only if between seventeen and twenty-two days old.) In the case of a positive result, the vaginal introitus of the mouse is established by the fourth or fifth day and the animal is then killed and its ovaries fixed in Zenker's solution. They are embedded in paraffin and serial sections are made and studied. The conditions which indicate the presence of anterior pituitary hormone are grouped into three categories by Aschheim and Zondek, as follows:

Anterior Pituitary Reaction One (APR I).—(The "ovulation" reaction): The ovaries show the presence of normal ripening follicles, while if autopsy is delayed normal corpora lutea are seen and ova may be found in the fallopian tubes.

APR II.—(The "hemorrhagic cyst" reaction): The ovaries grossly show the presence of fine reddish dots, which correspond to hemorrhages into normal and abnormal follicles, and are apparently due to the intense congestion set up by the

hormone. In the present study the finding of this reaction is not charted, since it is invariably an accompaniment of reaction III and does not seem to yield any important additional information. In the diagnosis of pregnancy, however, it is of considerable value as it is readily perceptible grossly.

APR III.—(The “luteinization” reaction): In this case the ovaries present a process of luteinization of the cells of follicles and the formation of abnormal structures resembling corpora lutea in which ovulation has not occurred and the ovum remains imprisoned. It is also worthy of note that these structures occur much sooner than normal corpora lutea would be formed following ovulation and in one instance they were noted forty-eight hours following the first injection of serum from a patient with an early pregnancy.

The changes in the vaginal mucosa which accompany the various processes seen in the mouse ovaries are also of interest and have been studied in a smaller series in view of the recent observations of Wiesner. In the case of APR I, the vaginal mucosa shows the cornification characteristic of the stage of estrus, and is identical to the change elicited by the ovarian follicular hormone in spayed mice (Allen-Doisy test). On the other hand, when APR III is obtained alone the vaginal mucosa is altogether different as it is composed of tall cylindrical cells at the surface (“pseudopregnancy” of Evans and Long; “mucification” of Wiesner and Patel), and is similar in appearance to the mucosa of a mouse during gestation.

RESULTS

The present report deals with the results obtained from the examination of 319 patients, and includes the cases mentioned in the two preliminary communications (Table I).

Some difficulty has been experienced in grouping the patients on a clinical basis, since a number of important factors have been taken into consideration and in some cases the same individual would seem to belong to more than one category. However, it was apparent that all those cases having gross anatomic lesions in the pelvis should be classed separately, while women during pregnancy, postpartum, the menopause, and following castration fell into definite single groups. The patients with functional diseases manifested by disturbances of menstruation offered most difficulty and defied any systematic classification based on such features as obesity, atrophy of the uterus, hirsutes, duration of symptoms, etc. It was therefore deemed advisable to group them purely on the basis of their symptoms as regards menstruation, and the final classification was as follows:

- A. Normal controls.
- B. Miscellaneous gynecologic diseases.
- C. Pregnancy and postpartum.
- D. Castration:
 - a. Operative extirpation of the ovaries.
 - b. Postradiation amenorrhea.
- E. Menopause and postclimacteric.

F. Disturbances of menstruation during active sexual life:

1. Functional amenorrhea.
2. Irregular menses.
3. Dysmenorrhea with regular menstrual cycle.
4. Regular but scanty menses.

A. NORMAL CONTROLS

The patients used as controls for this series consist of 36 women giving a history of normal menses. Pelvic examination in each case revealed no extensive pathology beyond possibly a mild infection of the cervix, an uncomplicated retroversion, a Bartholin's cyst, etc. As regards the menstrual cycle, 3 patients were menstruating at the time the blood was obtained, in 7 menstruation was expected within one week, in 5 the periods had finished a few days before, and in 21 the patients were in the intermenstruum or the exact date of the last menstrual period was not obtained. In every instance a negative reaction was found.

TABLE I. TOTAL RESULTS

| | APR I | APR III | APR I-III | NEG. | TOTAL |
|------------------------------------|-------|---------|-----------|------|-------|
| Normal controls | 0 | 0 | 0 | 36 | 36 |
| Miscellaneous gynecologic diseases | | | | | |
| a. Before menopause | 2 | 0 | 0 | 34 | 36 |
| b. Postclimacteric | 3 | 0 | 0 | 9 | 12 |
| Normal pregnancy | 10 | | 48 | 14 | 72 |
| Postpartum | 0 | 0 | 0 | 12 | 12 |
| Abnormal pregnancy | 0 | 0 | 0 | 9 | 9 |
| Operative castration | | | | | |
| a. Within 3 months postoperative | 8 | 0 | 0 | 11 | 19 |
| b. After 3 months | 11 | 0 | 0 | 2 | 13 |
| Radiation castration | 8 | 0 | 0 | 6 | 14 |
| Menopause | 7 | 0 | 0 | 15 | 22 |
| Postclimacteric | 4 | 1 | 0 | 2 | 7 |
| Amenorrhea (over 6 months) | 4 | 1 | 4 | 5 | 14 |
| Amenorrhea (short duration) | 0 | 0 | 0 | 7 | 7 |
| Irregular menses | | | | | |
| a. Shortened intervals | 2 | 1 | 0 | 7 | 10 |
| b. Delayed menses | 0 | 0 | 0 | 15 | 15 |
| c. Totally irregular | 0 | 0 | 0 | 7 | 7 |
| Dysmenorrhea; regular cycle | 3 | 0 | 0 | 6 | 9 |
| Scanty menses; regular cycle | 0 | 0 | 0 | 5 | 5 |
| Total | | | | | 319 |

B. MISCELLANEOUS GYNECOLOGIC DISEASES

A total of 48 patients with various anatomic lesions of the pelvis were examined, and the results are charted in Table II. Owing to the findings in the menopause group, it was deemed advisable to classify separately the patients who had passed the climacteric (as manifested by their age and amenorrhea of over one year's duration). It is thus seen that only two of the women before the climacteric gave a positive reaction (APR I), but it must be stated that both were over forty

years of age and thus probably represent an early menopause effect. It is worth noting that five patients with glandular hyperplasia endometrii (three of whom were over forty years of age), and three with a previous hysterectomy and the conservation of at least one ovary, gave negative results. It is also of interest, since other workers have reported a number of positive findings in patients with malignant tumors, that only one of the cancer patients gave an APR I, in spite of the fact that eight of the cancer patients were well past the climacteric.

TABLE II. MISCELLANEOUS GYNECOLOGIC CONDITIONS

| | BEFORE MENOPAUSE | | | POSTCLIMACTERIC | | |
|----------------------------------|------------------|------|-------|-----------------|------|-------|
| | APR I | NEG. | TOTAL | APR I | NEG. | TOTAL |
| Acute salpingitis | 0 | 4 | 4 | | | |
| Chronic salpingitis | 1 | 13 | 14 | | | |
| Fibromyoma uteri | 1 | 3 | 4 | 1 | 1 | 2 |
| Total hysterectomy | 0 | 3 | 3 | | | |
| Dermoid cyst ovary | 0 | 1 | 1 | | | |
| Serous cystadenoma ovarii | | | | 1 | 0 | 1 |
| Glandular hyperplasia endometrii | 0 | 5 | 5 | | | |
| Carcinoma cervicis uteri | 0 | 5 | 5 | 1 | 5 | 6 |
| Carcinoma ovarii | | | | 0 | 1 | 1 |
| Carcinoma of the rectum | | | | 0 | 1 | 1 |
| Tumor labium majus | | | | 0 | 1 | 1 |
| Total | 2 | 34 | 36 | 3 | 9 | 12 |

C. PREGNANCY AND POSTPARTUM

In my first communication² it was stated that 48 patients representing various stages of pregnancy had been examined with 13 negative findings while 8 patients had yielded APR I alone, and APR III had been noted 27 times. Twenty-four additional patients must be reported now, but with a much higher percentage of positive results, since APR II or III, with or without I, was found 21 times, APR I alone twice, and only one negative. The total figures for 72 patients during pregnancy would now be 14 negative and 58 positive, 48 yielding APR III (with or without I or II) and 10 APR I alone.

Twelve postpartum patients gave negative results, and the blood had been taken as early as forty-eight hours and as late as six months after delivery. Three women with ectopic gestations, one with a missed abortion of six months' duration, and five with incomplete abortions or postabortion bleeding, also proved negative.

D. CASTRATION

A total of 32 patients who had had a previous bilateral oophorectomy have been examined, and in 19 cases the blood serum gave a positive APR I. The majority of these patients had been operated upon for extensive pelvic inflammatory disease and they were seen at

varying periods, a positive reaction being found as early as nine days and as late as fourteen years after operation. A few gave a negative test a short time after operation but became positive later, and this may offer an explanation for a large number of the negative results. If the patients are divided into two groups according to the length of time elapsed since castration, it is seen that only 8 positive were found in 19 women examined during the first three months, but there were 11 positive out of 13 who were seen at longer intervals after operation. This is also in keeping with the histologic studies of Rössle who found that whereas castration changes were sometimes present four to five days after operation they invariably were not apparent before a considerable length of time had elapsed.

In addition to the patients who had had an operative extirpation of the ovaries, 14 women who had received massive doses of radium or x-rays to the pelvis were also examined. Of these, 8 showed the presence of anterior pituitary hormone (APR I) in the blood, while it was not demonstrated in six others. In these cases, with one exception, the examinations were conducted at periods of longer than three months from the time of radiation.

E. MENOPAUSE AND POSTCLIMACTERIC

Twenty-two patients representing the climacteric period have been examined, and a positive APR I was obtained seven times. The criteria used to determine whether a woman was in the menopause or not were her age plus menstrual irregularities and the common manifestations of hot flushes, dizziness, and headaches. The menstrual irregularity complained of generally consisted of too frequent and too profuse periods. Only one of the patients with anterior pituitary hormone in the blood was less than forty years of age, but a climacterium precox was observed in four of the negative group.

On the other hand, the examination of the blood of 7 patients who had definitely passed the climacteric, as manifested by amenorrhea of from one to six years' duration, gave positive results in five instances. Of these, four showed APR I alone, and one APR III. It must also be observed that a positive APR I was obtained from the examination of the blood of three patients who had passed the menopause and in addition had an anatomic lesion in the pelvis (fibromyoma uteri; serous cystadenoma ovarii; carcinoma cervicis uteri).

At this point attention must be drawn to the fact that with the exception of pregnant women a positive test has not been obtained in girls of less than twenty years of age. This includes one with a functional amenorrhea, eight with irregular menses, and one with dysmenorrhea. These results draw a sharp contrast between menstrual disturbances of the menarche and of the menopause.

F. DISTURBANCES OF MENSTRUATION DURING ACTIVE SEXUAL LIFE

This group comprises 67 patients with various menstrual disturbances. Each of these women was carefully examined and no gross pathology to account for any of the symptoms could be demonstrated, while the possibility of pregnancy was excluded by repeated examinations whenever this was indicated.

1. *Functional Amenorrhea*.—This group has been subdivided into two divisions. First, are 14 patients who complained of periods of amenorrhea persisting for longer than six months. Owing to the importance of this condition from a functional standpoint, a list of the patients with a few details of their histories is given in Table III. It is seen that in every instance there is evidence of a very serious disturbance and with only two exceptions there was either an accompanying atrophy of the uterus, the presence of obesity, or both. In 10 cases also there was a history of preceding menstrual irregularities or the condition was primary. Nine of the 14 gave positive tests for the presence of anterior pituitary hormone in the blood, 4 showing APR I alone, one APR III alone, and 4 a combination of APR I and III.

In contradistinction to this group are 7 women who complained of short periods of amenorrhea, although their menses had previously been regular and normal. The duration of the symptom varied from six weeks to five months, and most of the patients came to inquire if they were pregnant. The examination of the blood in every instance proved negative, a fact which is of great interest since the test is most commonly used for the diagnosis of pregnancy and this is the type of patient in whom the differential diagnosis is most important. In two cases the blood showed large amounts of ovarian follicular hormone thus corresponding to the "hyperhormonal amenorrhea" mentioned by Zondek.

2. *Irregular Menses*.—This category has been subdivided into three smaller groups according to the type of irregularity demonstrated.

a. *Shortened Cycle*: Ten patients complained that their menstrual periods appeared at shortened intervals every two to three weeks. In only one instance (negative test) was any atrophy of the uterus found, and in none was a note made of obesity. Two of this group gave an APR I, and one an APR III. The menses were described as profuse in two of the positive cases, while in the third they were scanty and accompanied by dysmenorrhea.

b. *Delayed Menses*: In contradistinction to the first group, fifteen patients complained of prolonged intervals between their periods and in some instances menstruation occurred only every few months. In this division the examination of the patients showed evidence of extensive disturbances. In 7 cases the patients were obese, in two there was a hypoplasia of the uterus, and in two, hirsutes. Seven complained of

TABLE III. FUNCTIONAL AMENORRHEA OF OVER SIX MONTHS' DURATION

| PATIENT | APR TEST | AGE | GRAV. | DURATION AMENORRHEA | SYMPTOMS PRECEDING AMENORRHEA | OBESITY | HYPOPLASIA UTERI | B. M. R. | REMARKS |
|---------|----------|-----|-------|------------------------|---|---------|---------------------|----------|---|
| M. M. | I | 27 | 1 | 4 years | Sudden onset | Yes | No | - 8 | |
| D. K. | I-III | 20 | 0 | 7 years | Primary | No | Yes? | - 2 | |
| M. G. | I-III | 25 | 0 | 18 months | Menses became scantier for 6 months | Yes | Yes | -20 | Thyroidectomy 9 years before |
| P. E. | I | 24 | 2 | 17 months | Sudden onset | | Yes | | |
| F. E. | I-III | 33 | 6 | 8 months | Scanty periods for 3 years | Yes | No | - 8 | |
| M. | III | 32 | 0 | 3 years | Irregular menses (every 6 mo. or more) for 11 years | | No | | |
| N. | I-III | 32 | 0 | 8 months | Irregular (every 6-8 months) | Yes | No | | |
| H. V. | I | 32 | 0 | 17 months | Irregular with amenorrhea of 3-12 months since menarche | No | Yes | | Exam. of blood 5 mo. before was negative |
| R. P. | I | 29 | 3 | 8 months | Sudden onset | Yes | No | 5 | |
| M. A. | Neg. | 36 | 0 | 8 months | Sudden onset | No | Yes | | Patient has cramp-like pains each mo. but no flow |
| F. M. | Neg. | 21 | 0 | 14 months | Irregular (every 30-60 days) since menarche | Yes | Yes | -11 | |
| V. C. | Neg. | 26 | 1 | 7 months | Sudden onset | No | No | -21 | |
| C. | Neg. | 17 | 0 | 18 months | Patient has only had five irregular, scanty periods | No | Yes | - 3 | Epileptic |
| K. | Neg. | 35 | 0 | 5 years | Menses always delayed | No | Yes | | |

scanty menses, three of marked dysmenorrhea, and two of hot flushes. The examination of the blood serum was negative in every case.

c. *Totally Irregular Cycle*: In 7 patients the history obtained showed a total irregularity in the occurrence of the menses, the interval at times being shortened, in others prolonged. An atrophy of the uterus was noted twice, and in two other instances the menses were scanty. No positive results were found in this group.

3. *Dysmenorrhea*.—The study of patients with dysmenorrhea accompanying a regular menstrual cycle was approached with much interest owing to the reports of improvement following x-radiation of the hypophyseal area. Nine women belonging to this category have been examined, and an APR I was obtained three times. Scanty periods were complained of in addition to the dysmenorrhea by two patients, but the test proved negative in both instances.

4. *Scanty Menses; Regular Four-Week Cycle*.—Since the onset of scanty menses at times precedes the occurrence of long periods of functional amenorrhea, it seemed of importance to examine patients who presented this symptom but were still having an otherwise normal period each month. Five such women have been seen, but in each case the blood was negative. The duration of the symptom varied from seven months to as long as eight years. An atrophy of the uterus was noted once, and a marked recent increase in weight in two other instances. Three patients were multigravidae, and two nulligravidae.

DISCUSSION

The Aschheim-Zondek test is to be regarded as quantitative as well as qualitative, and the difficulties of biologic assay of hormones of this type are well known. It is readily seen that the test is not delicate enough to demonstrate the anterior pituitary hormone which is present in the blood under normal conditions, but on the other hand we do not know how much of an increase in the amount of the substance of the anterior hypophysis must exist in the blood before it can be demonstrated in this manner. There are also undoubtedly certain individual variations in the reactions of each mouse, and since it is impossible to inject a large series of these animals with the blood from the same patients, this may lead to further error. Thus, a number of patients in whom there is really a considerable increase in the amount of the hormone might yield negative results. However, a positive reaction is to be considered as clear evidence of a hypersecretion of anterior pituitary hormone, and the resultant errors on the negative side must be offset by the analysis of large series of patients.

Since previous studies with the Aschheim-Zondek reaction have almost without exception been done for the sole purpose of developing a test for the early diagnosis of pregnancy, and urine instead of blood has been examined, it is difficult to find other results in the literature which compare directly with those of this

series. Fels⁶ examined the blood of a small number of patients and obtained positive results in 30 out of 38 pregnant women, and negative in 9 with normal menstruation. In their original study, Aschheim and Zondek⁴ found APR I in the urine of one normal woman, in one case of acromegaly, in two cases of myxedema, in one case of hyperthyroidism, in two cases of severe pelvic inflammation, in one case of amenorrhea associated with a papillary cystadenoma, in three cases of functional amenorrhea, and in seven cases of genital carcinoma. In a recent article, however, Zondek¹ announces that he has found APR I in some cases following the menopause and after bilateral oophorectomy. Ehrhardt⁷ states that he has found APR I in similar groups of patients and also following castration, in climacterium precox, in the early stages of the menopause, and in the presence of lipoid necrosis. Wagner⁸ in 151 cases of amenorrhea did not find a single APR II or III. Schmidt⁸ obtained positive results from the urine of two out of 11 patients with carcinoma, and negative in 5 with amenorrhea, two with a hypophyseal tumor, and one with acromegaly. Karg⁸ obtained 15 negative results in patients with carcinoma and postradiation amenorrhea. Hannan⁹ with his modification of the test found positive results from the examination of the urine of some patients with secondary amenorrhea, fibroids, genital carcinoma, exophthalmic goiter, and during the menopause. Solmes and Klopstock¹⁰ emphasize the importance of doing the test as a guide to the therapy to be employed in cases of amenorrhea and the menopause and divides them into "hypo-" and "hyperhormonal" groups. There has, however, apparently been no systematic effort to analyze the findings from this test in nonpregnant women.

The first main conclusion which must be drawn from the results obtained in this series is that a positive test does *not* occur in women with normal menstruation, and that there is always a marked endocrine disturbance whenever it does occur.

The most outstanding group of those giving a positive result is made up of women during gestation, and the accuracy of the Aschheim-Zondek test when used for the diagnosis of pregnancy is now generally recognized. The reaction in the test animal in these patients is characterized by the occurrence of APR II and III, and this is a most interesting feature because we find a tremendous production of the anterior pituitary "luteinization" hormone just at the time when the ovary contains a persistent corpus luteum and there is an absence of ovulation.

The hypersecretion of the anterior lobe during pregnancy is in keeping with the histologic changes of the gland which were described by Erdheim and Stumme¹¹ and which consist mainly of a marked proliferation of the "Hauptzellen" or chromophobe cells. These changes have been attributed to a direct stimulation of the anterior hypophysis by some substance found in the placenta (Berblinger,¹² Adachi,¹³ Lehmann¹⁴), and which may be ovarian follicular hormone (Baniecki¹⁵). However, considerable evidence has been adduced that the placenta produces or stores a substance which stimulates the ovary in the same manner as the anterior lobe hormone (Collip¹⁶) and this is a possible source for the large amounts found in the blood during pregnancy.

In the next important group of women with anterior pituitary hormone in the blood, we find a hyperactivity of the anterior lobe due to a complete removal of ovarian influence, and in this case the characteristic finding is an APR I, namely a predominance of the "ovulation" hormone. In the first place are women whose ovaries have been completely extirpated by operation or destroyed by intensive radiation. The hypersecretion of the anterior lobe in these cases is again in keeping with the gross hypertrophy, and the histologic changes which have been noted by a number of authors (Tandler and Gross,¹⁷ Kon,¹⁸ Kolde,¹⁹ and Rössle²⁰) consist in the human of an increase in the eosinophilic cells and the appearance of a much-debated type of cell, the "castration cell." Evans and Simpson²¹ also believe that these changes are accompanied by a progressive storage of the hormone in the gland, and this is further borne out by the fact that the use of anterior pituitary gland implants from castrated rats provokes reactions in the ovaries of the test animals many times greater than similar implantations of normal hypophyseal tissue (Engle,²² Evans and Simpson²³). There is as yet no definite information as to the removal of which ovarian factor is responsible for the profound changes in the anterior lobe. Certain as yet incomplete experiments (Fluhmann and Kulchar) point to the fact that the ovarian follicular hormone is not altogether the one at fault, for the constant administration of this substance to castrated rats over a period of three months failed to prevent the appearance of the characteristic "castration" cell.

In addition to those women who have had an operative or radiation castration, it is felt that two other types of patients belong to the same category from an etiologic standpoint, namely those with a prolonged functional amenorrhea and those in the postclimacteric period. Ovarian activity has completely ceased following the menopause, and the fact that the amenorrheic patients who yield a positive test give evidence of a prolonged and intense disturbance lead one to assume that they also may have a complete deficiency of ovarian function. The existence of a positive test in patients with prolonged periods of functional amenorrhea would thus suggest a poor prognosis, although not necessarily a hopeless one. This was illustrated by one patient, aged twenty-five, who gave a strong APR I after eighteen months' amenorrhea. Following treatment she had a scanty period, and the examination of the blood on two occasions during the succeeding two months proved negative. It will be of importance to determine if the amenorrheic patients with APR I correspond in general to the group described by Frank²⁴ as not showing a cyclical appearance of ovarian follicular hormone in the blood.

Since a *total deficiency* of ovarian function profoundly affects the anterior lobe and results in a massive production of its hormone, an important question arises as to whether a similar condition may super-

vene as a result of a "hypofunction" of the ovary. As applied to a complicated structure such as the ovary, which is constantly changing and produces different hormones at different stages, this term is somewhat indefinite and cannot be used as freely as it is applied to glands such as the thyroid or the adrenal. However, it is in general usage and applied to disturbances which are manifested by scanty menses, amenorrhea, or delayed menses. This conception of course arose at the time when the ovary was considered as the prime factor in the occurrence of menstruation, but in view of the recent work pointing to the anterior hypophysis as the "trophic" (Hofbauer) or "motor" (Zondek and Aschheim) center of ovarian activity, it is readily seen that a primary "hypopituitary" with a secondary "hypo-ovarian" condition forcibly enters the picture. With the exception of those patients who have long-continued periods of amenorrhea and in whom it is felt that there is possibly a complete cessation of ovarian function (whether temporary or permanent), no patient of this series who could be said to have an ovarian "hypofunction," as manifested by hypomenorrhea, delayed menses or short periods of functional amenorrhea, gave a positive anterior pituitary hormone reaction.

There now remain a number of patients in whom APR I has been obtained, but who present an altogether different clinical picture. In the first place, there are women in the early stages of the menopause whose chief complaint is irregular menstruation with shortened intervals; secondly, a small number of younger women also with too frequent menses; and finally, patients with dysmenorrhea. Since the number of observations in the last two groups is very small, it is felt that any conclusion is scarcely justified. However, it is very remarkable that whereas the patients whose menses are scanty or persistently delayed do not give positive reactions, a few have been obtained where the periods occur more frequently than usual, and it is also noted that the menstrual flow in some of these cases was prolonged and profuse. It would seem as though in these instances we may be dealing with conditions the exact reverse of the "hypofunction" group discussed in the preceding paragraph, namely, a primary "hyperpituitary" with a secondary "hyperovarian" condition. This conception cannot be held by any means as established, but it must be considered as a strong possibility, and it is further strengthened by the reports of improvement in the occurrence of the menses or the diminution of dysmenorrhea following x-radiation of the hypophyseal area.

SUMMARY

1. The recent advances in our knowledge of the physiology of the female sex organs point to the importance of studying pelvic diseases from a "functional" standpoint. This may be partly accomplished by

determining the presence or absence of unduly large amounts of anterior pituitary and ovarian follicular hormones in the blood or urine.

2. The presence of large amounts of the anterior pituitary sex hormone (or hormones) in the blood is readily determined by a method based on the Aschheim-Zondek "pregnancy test," and the results of the examination of 319 patients are reported in this study.

3. The test proved negative under the following conditions:

a. At any stage of the cycle in women with a normal menstrual history.

b. In patients less than forty years of age with anatomic pelvic lesions, such as carcinoma cervicis uteri, fibromyoma uteri, pelvic inflammatory disease, glandular hyperplasia endometrii, etc.

c. In patients with "hypo-ovarian" conditions, as manifested by short periods of amenorrhea, scanty regular menses, or persistently delayed menses.

4. The patients with positive results could be classed into three categories:

a. During pregnancy, when the test is characterized by the "haemorrhagic cyst" and "luteinization" reactions.

b. In the presence of a total ovarian deficiency, when the test gave mainly the "ovulation" reaction. This group was represented by women following a complete operative extirpation of the ovaries, after radiation castration, and after the menopause. Some patients with prolonged periods of functional amenorrhea also probably belong to this category.

c. A group composed of women in the early stages of the menopause with irregular profuse periods, and a small number of younger patients with irregular (too frequent) menses or severe dysmenorrhea. The test when positive showed the "ovulation" reaction. The etiology factor is not known, but the possibility that the symptoms may be the result of a "hyperpituitary" condition must be considered.

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BENIGN UTERINE BLEEDING, WILFRED SHAW'S GROUPS

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NEW views concerning the pathology and physiology of uterine bleeding should attract considerable attention. In his paper entitled "Irregular Uterine Hemorrhage" published in *The Journal of Obstetrics and Gynecology of the British Empire*, 36: No. 1, 1929, Wilfred Shaw has offered some very interesting observations. Two hundred cases of irregular uterine bleeding, that is, cases without evident pathology, such as carcinoma, leiomyoma, polyp, etc., have been studied intensively by him and have been divided into definite groups. The microscopic pathology of the uterus, endometrium and ovary has been carefully studied and reported. Of these 200 cases he has been able to group about 82.5 per cent and to point out to his satisfaction some of the reasons for their bleeding. The remaining 17.5 per cent he could not group or account for their hemorrhagic diatheses.

Part of his paper is given over to a survey of the history of the study of uterine bleeding and to the various theories of other investigators. Certain of their ideas he accepts and others discards. He then proceeds to the examination of material from patients who have borne children, in an attempt to rule out the so-called "subinvolution theory" of abnormal uterine bleeding. His own conclusions best show his views in regard to this theory and also to the "uterine fibrosis theory." A summary of his study in his own words follows:

"The present-day view of the etiology of irregular uterine hemorrhage attributes the majority of cases to subinvolution changes in the vessels of the uterus. . . . The involution of the arteries of the puerperal uterus is through a granular atrophy of the muscle wall and caliber of the lumen of the vessels is reduced by means of a proliferation of the subendothelial tissues.

"The elastic tissue content of the uterus is increased after each pregnancy. Elastic tissue is deposited around the vessels, particularly around the veins, in the media and internal elastic lamina of the arteries and also between the muscle bundles of the myometrium. . . . The increase in the amount of elastic tissue is to be regarded as a physiologic process and there is no reason to believe that the deposit of elastic tissue is in any way determined by subinvolution changes in the uterus. . . . It has been shown that the amount of elastic tissue in the uterus depends solely upon the parity of the patient and is independent of local conditions

in the pelvis. Cases in which a large amount of elastic tissue can be demonstrated have been obtained from patients who have suffered from no menstrual disturbance whatsoever. It is, in consequence, concluded that irregular uterine hemorrhage is in no way determined by the amount of elastic tissue present in the uterus. No association between subinvolution and irregular hemorrhage has been found. . . .

"No evidence has been found of the existence in menstruating women of a condition in which the muscle cells of the uterus are replaced by fibrous tissue. For these reasons it is maintained that cases of irregular uterine hemorrhage should not be attributed either to subinvolution or to a fibrotic state of the myometrium.

"The uteri of women who have borne a large number of children are firmer than the uteri of nulliparae through the deposit of elastic and connective tissue."

Shaw's most important contributions to the study of uterine hemorrhage are his grouping of cases and his recognition of certain ovarian disturbances. His four primary divisions are quite distinct and may be used in clinical practice. The irregular hemorrhage he believes is due to a disturbance of the physiology of the ovary which is in its turn probably controlled by something else at present unknown. A résumé of the four groups and the essential characteristics of the history and pathology of each group is given below.

Group I. The so-called "metrophathia hemorrhagica" of Schröder accounts for 26.5 per cent of the cases. Most of these patients are between forty-one and fifty years of age but occasionally a few are met under thirty. The history of the irregular hemorrhage is very important. The monthly periods have been normal and regular, when suddenly a period is skipped. The next period may start off normally but at the end of the usual time the bleeding continues either more or less severe and may last from three to eight weeks. The flow is frequently very severe but may be small in amount. The period of amenorrhea is not always essential and occasionally is not present in the history but a continued period of vaginal bleeding, either following a succession of normal periods, or a succession of very large and prolonged periods with a normal interval, is essential. In 50 per cent of these cases, however, a very definite history of the amenorrhea phenomenon was obtained. Pelvic examination shows a uterus normal in size or slightly larger than it should be at this time of life, usually smooth and symmetrical although an occasional fibroid may occur. In one or both vaults a slight enlargement of the ovary may be felt which suggests the presence of a small ovarian cyst. At operation, when the patient is everted, a very large amount of thick, dark red endometrium is obtained. The uterus is found to be large and symmetrical and an ovarian cyst is present usually in one but occasionally in both ovaries. This cyst is usually about 1 inch to 1½ inches in diameter and contains a clear fluid and resembles a follicle cyst. Microscopically most cysts prove to be cystic ripening follicles. The remainder of the ovarian tissue is small, corrugated and definitely atrophied. No fresh or even recent corpora lutea can be found. Macroscopically the endometrium is thick, red, purplish, of the typical polypoid type and scattered throughout the endometrium areas of necrosis may be found which probably account for some of the bleeding at least. (Areas of necrosis of this type have been recently reported by Fluhmann.³) Microscopically there are areas of disintegration with cystically dilated glands in the superficial layer. The basal layer shows a hyperplasia of the glands and stroma. Very full capillaries and extravasated blood are also present. This type of uterine bleeding shows an association between uterine and ovarian dysfunction, as both the endometrium and ovaries are disturbed. The

uterine endometrium suggests a hyperactivity in its part and the ovaries appear shrunken and atrophied and presumably of diminished function.

Shaw's interpretation is about as follows: that the abnormal endometrium acts upon the ovaries to inhibit follicle ripening or formation of the corpus luteum and that the ovaries produce the toxin that causes disintegration of the premenstrual endometrium of normal menstruation and so disintegration of the superficial layers of the polypoid endometrium occurs and thus hemorrhage.

Shaw suggests nothing new as a mode of treatment, relying upon curettage in the young and either radium, x-ray, or hysterectomy in the older group. An occasional cure has been noted following careful and thorough curettage, as though the removal of the polypoid endometrium relieved the ovary from uterine control.

Group II. This group Shaw calls the "epimenorrheal group" and it accounts for about 36 per cent of the total number of cases. This type occurs in women of all ages but generally from forty to fifty years of age. It is the most common form of benign bleeding and the history given by these patients is quite typical. A normal menstrual cycle is suddenly changed to a cycle of two weeks, slightly more or less. With the new interval the amount of blood lost at the period is greater and the flow lasts longer. Most of the patients have borne children, a fact of some importance. Pelvic examination shows a symmetrically enlarged uterus with occasionally a fibroid, the vaults are negative. On curetting the patient the endometrium is found to be thicker than normal but may be reduced in amount. Macroscopically the uterus is symmetrically enlarged and the ovaries are small, corrugated and atrophied but hemorrhagic cystic follicles are present. Microscopically there is no evidence of infection in the uterus, the surface epithelium is normal and the glands are of normal size and contour. No cystically dilated glands are found and there are no areas of necrosis or disintegration as seen in Group I. The stroma, however, is very edematous and hyperemic and this is a nearly constant finding. The excessive hemorrhage at the period may be explained by the hyperemia of the stroma. Microscopically in the ovary too many corpora lutea are found. In a considerable percentage of cases two corpora lutea of the same age were present. These corpora lutea are of normal appearance both macroscopically and microscopically. In one case Shaw reports that, although a removed ovary containing a corpus luteum corresponded to the sixteenth day of a normal cycle and represented the condition two or three days after ovulation, this particular ovary had been removed on the eleventh day of a fourteen-day cycle and that therefore ovulation had occurred upon the ninth day, which is five days earlier than it should be. He therefore concludes that ovulation takes place earlier than normal and that the ovarian rhythm is too frequent. He believes that this ovarian dystrophy then explains the too frequent periods. The corpus luteum of the preceding cycle, though not abnormal, had not retrogressed sufficiently and the number of follicle cysts were more than normal. The edema and hyperemia of the endometrium is explained by the too great ovarian activity and the increase in bleeding by the former.

The treatment that he advocates is no different, curettage, x-ray, radium, and hysterectomy being suggested.

Group III. This group Shaw names the "hypomenorrheal group" and it comprises 8 per cent of the total. The ages of the patients are from forty to fifty years with an occasional younger patient. Here the menstrual cycle is increased from thirty-five to forty-two days, and there is an increase in the amount of blood lost and in the length of the flow, or the cycle is irregular from three to six weeks with the same excessive loss of blood. The uteri are either slightly enlarged or normal in size, occasionally containing a fibroid. Macroscopically the ovaries are grossly pathologic, being very hyperemic, with large follicular hematomas. The

endometrium is not abnormal in its cyclic changes. An occasional hyperplasia of the endometrial glands is present and the endometrium shows great edema and hyperemia. Shaw feels that the numbers in this group are too small to draw any conclusions but feels that ovarian disturbances account for the irregular ovulation and flowing. The hyperemia of the endometrium probably accounts for the increased hemorrhage and the hyperemia and edema may be accounted for by ovarian dysfunction.

The treatment is the same, curettage in the younger patients, and x-ray, radium, or hysterectomy in the older.

Group IV. This group Shaw designates as the "metrorrhagic type" and it comprises 5.5 per cent of the total. The average age of this group is from thirty to forty years. The patients have normal periods with a regular rhythm, but between their periods a vaginal discharge occurs varying from true blood to a pinkish discharge. This discharge stops before the onset of the next period and is occasionally associated with severe pain in the back. The flow is not excessive but it is continuous and is therefore very disagreeable. The patients are occasionally very highly sexed. The uterus shows no abnormality in size or shape but the ovaries are enlarged and hyperemic. There is a true hyperplasia and hypertrophy present in these ovaries suggesting a decided hyperactivity. The endometrium shows normal cyclic changes, but enormous hyperemia. This hyperemia is the essential feature, although edema is also present. The intermenstrual hemorrhage is probably due to oozing from the intensely hyperemic endometrium, and it is not similar to menstrual flow. Shaw believes that the overactive ovaries are responsible for the greatly hyperemic endometrium.

The treatment suggested is the same as in the other groups.

Group V. A few cases of endometritis were studied and included in the series. These were 6.5 per cent of the total number. True inflammatory lesions were found scattered among the superficial and middle layers of the endometrium. In the acute stage there is great infiltration of the stroma with leucocytes and round cells. Normal cyclic changes are active in the endometrium as long as the ovaries are not interfered with. The presence of plasma cells in these inflammatory conditions is essential to make the diagnosis, especially of the chronic cases. Acute endometritis is characterized by greatly increased flow, one or two months at a time, with a large amount of purulent discharge. Acute inflammation may follow typhoid fever, pneumonia, puerperal sepsis, gonorrhea, etc. The chronic type is usually found in uteri that contain infected polyps, fibroids, carcinomas, etc. In all cases typical inflammatory changes as seen in other organs of the body in inflammatory processes are found. The treatment of the acute cases is expectant wherever possible.

In 17.5 per cent of the 200 cases no explanation for the disturbed function could be found. Shaw's study, then, has been able to point out satisfactorily four groups, and, including the endometritis group, five groups of cases with irregular uterine hemorrhage. Cases in individual groups have similar histories, similar physical findings and the pathologic histology is definite for each group. It is possible now to view patients with abnormal bleeding more clearly and understandingly.

DISCUSSION

Before an appreciation of Shaw's work is possible it is necessary that the probable behavior of the ovary and endometrium throughout a normal menstrual period be understood. The correct time of ovulation and of corpus luteum influence is important. Below is a short

description of a normal menstrual cycle and it is, of course, subject to variation. A diagram is presented that may clarify this phenomenon. The plan is diagrammatic but gives the essentials of the cycle. This description and the diagram were suggested by the recent work of Hartman.²

A woman whose periods are regular and normal starts to flow on the first day of the month. During the flow the upper layer of the endometrium is cast off and with it a considerable amount of blood from engorged capillaries in the stroma. After the period is over on the fifth day after the onset the endometrium begins to regenerate and the so-called resting stage is brought about. Soon a gräffian follicle commences to enlarge and becomes ready to allow the escape of the ovum. During this time there is a slight swelling and congestion of the endometrium. On the fourteenth day, with the mild congestion of the resting stage at its height, ovulation takes place and the corpus luteum

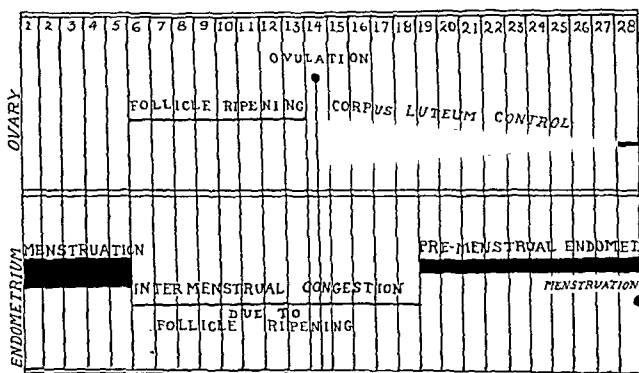


Fig. 1.—Chart showing diagrammatically a normal menstrual period. It is divided into twenty-eight days with menstruation starting and lasting five days and this commencing again on the twenty-eighth day. The interval of intermenstrual congestion due to follicle ripening is shown. The period of corpus luteum control is shown diminishing until menstruation takes place.

is formed. The endometrium during the presence of the corpus luteum becomes thickened and swollen and congested again until on the twenty-eighth day of the cycle, when the corpus luteum has retrogressed sufficiently, the premenstrual endometrium becomes menstruating endometrium.

In a series of cases reported from the Gynecological Section of the Tumor Clinic of the Massachusetts General Hospital,⁶ it was found that in 66 cases of uterine bleeding out of 243 no pathologic reason for the bleeding could be found. In 27 of these cases, and they must be the same types that Shaw studied, corpus luteum, gr. xv, and thyroid extract, 1.5 gr., per day were tried with success in 22 cases. Inasmuch as the corpus luteum is absent, even the evidence of a recent one in the Group I cases of Shaw's, is it not possible that corpus luteum therapy has a reasonable basis and that supplying this need in these cases will be of value? In the Tumor Clinic all cases of uterine

bleeding as far as possible are being classified according to Shaw's Groups I, II, etc. As most of these cases are at the age where radium rather than surgery is the proper treatment, difficulty will be found in obtaining material for corroborating his work. However, after the pathologic findings have been checked at operation and in the laboratory, and Shaw's work substantiated, an attempt will be made to select cases with abnormal ovarian pathology and to prescribe the proper gland extract for the patient. This would consist of corpus luteum. That there is reason for the choice of corpus luteum to prevent menstruation or to aid in checking abnormal hemorrhage may be seen from the fact that Crossen⁴ states that "undue lengthening of the interval between menstruation in some instances apparently is caused by the formation of corpus luteum cysts. In these cases the corpus luteum does not properly involute and through abnormal extension of its function prevents maturation of another follicle," and that Graves⁵ states that "the early theory that the corpus luteum presides over menstruation is no longer tenable, some even holding that menstruation is determined by the elimination of the corpus luteum." It is also true that during pregnancy, when there is no menstruation, the corpus luteum is apparently a very active part of the ovary. In substantiation of the action of the corpus luteum during menstruation the following paragraph from Kaufmann's Pathology⁶ giving the opinions of Seitz and Wintz is important: "There are many opinions concerning the condition of the corpus luteum or the relation of the corpus luteum to menstruation. . . . Seitz and Wintz postulate a very close relationship; stages in the function of the corpus luteum are related to phases in the menstrual cycle; (1) ripening and stretching of the follicles leads to premenstrual changes in the mucosa; (2) the stage of proliferation brings the premenstrual preparations to their full development and leads to the secretory phase in the endometrium; (3) the blossoming of the corpus luteum holds back the secretory phase in the endometrium and through its hormone stops the beginning of menstruation; (4) during the regressive phase of the corpus luteum, the inhibiting influences disappear and menstrual bleeding takes place. According to this, the corpus luteum therefore hinders menstruation. In pregnancy, the corpus luteum is at first persistent; there is, therefore, no menstruation."

In Group I the bleeding seems to be due to both an ovarian and endometrial disturbance. Shaw believes that the thickened polypoid endometrium may exert control over the ovary. It is probably more likely that the abnormal ovary has lost control of its own and of the endometrial cycle. The ovaries are atrophied and a follicle cyst is present. Ovulation has probably not taken place and so the proper physiologic processes are retarded. The corpus luteum and presumably its function are absent from the ovary. During the presence of the active

corpus luteum, premenstrual changes take place in the endometrium and menstruation does not take place until the activity of the corpus luteum is much lessened. Perhaps the abnormal follicle is unable to hold back or control the changing endometrium so that when premenstrual endometrium has fully developed menstruation is inevitable, and will be prolonged until a proper ovarian cycle can be reinstituted.

Below are given the reports of two cases of abnormal uterine bleeding that fall into Shaw's Group I. In one case a follicle cyst of an ovary was present, measuring about one inch in diameter. The remainder of the ovary was corrugated and atrophied and the other ovary was very small and atrophied. Unfortunately the cyst was ruptured inadvertently. Fig. 2, however, shows some corrugation and



Fig. 2.—Photograph of Case P. C. No. 1447 Shaw's Group I. Showing the hyperthrophied endometrium. The corrugated atrophic part of the ovary is conspicuous. The lower part of the ovary in the photograph is part of the cyst wall that had been inadvertently ruptured. The uterus is slightly larger than normal. The endometrial cavity has been curetted.

atrophy of the ovary and the darkness and thickness of the endometrium is evident in spite of preliminary curettage. No recent corpora lutea could be demonstrated in the removed ovary microscopically or in the left-in ovary macroscopically. It was not considered advisable to remove the other ovary and so proof of its lack of corpus luteum cannot be given.

CASE 1.—This patient, aged thirty-six years, single, was seen on June 22, 1929, because of uterine bleeding. Her periods had always been regular, every twenty-eight days, until December, 1928, when her period was slightly less than normal. The January period was skipped and no menstruation occurred again until June 1, 1929. Since that time she has been flowing steadily. The June period began normally but did not cease and she used about two napkins a day. Her blood studies were negative except that the platelets were large and greatly increased

in number. Because of the history a diagnosis of Shaw's Group I was made before operation. Examination under ether and subsequent operation showed a slightly enlarged uterus with no demonstrable adnexal pathology. There was a clear follicular cyst of the right ovary about one inch in diameter. The rest of the ovarian tissue, including the other ovary, was atrophied and wrinkled. The uterus and right ovary were removed. The left ovary was left in place. Following is a copy of the pathologic report: (1) Uterus measuring 8 cm. x 6 cm. with cavity 6 cm., amputated by coning out the cervix. The endometrium is hypertrophied and markedly injected. The uterine cavity contains blood and necrotic matter. The myometrium is negative. (2) The left tube is attached to uterus and normal. (3) The right ovary is atrophic, pale yellow in color and contains 2 small, clear cysts and 1 large thin-walled cyst, containing clear, colorless fluid. Microscopic diagnosis: hypertrophy of endometrium. Follicle cyst of ovary. Tube negative.

In the other case the patient flowed excessively following two separate periods of amenorrhea. Both her ovaries were removed along with the uterus and in neither ovary could any sign of a recent or old corpora lutea be found.

CASE 2.—This patient, aged forty-two years, married, with three children. She had been perfectly well up until four months previous to her visit to the hospital when, following a normal period, she flowed continuously for eighteen days. She then skipped two months and flowed again for twenty-two days. Her periods had always been from twenty to thirty days apart and small in amount. Ether examination showed a lacerated cervix, which was repaired. The uterus was large and a great deal of thick, red endometrium was removed. Abdominal operation then disclosed a fairly good-sized uterus without fibroids, a very small and atrophied right ovary and a left ovary about 3 cm. in diameter containing a cyst full of clear fluid. The rest of the ovary was rough and apparently atrophied. The pathologist sectioned both ovaries very carefully for signs of fresh or recent corpora lutea. He reported that it was impossible to find any sign of a corpus luteum in the ovarian tissue. Following is a copy of the pathologic report: "Specimen consists of a uterus amputated at level of internal os, both tubes and ovaries. Uterus 7 cm. from fundus to internal os. Endometrium slightly injected, surface granulated. Right ovary contains one simple cyst 1 x 1 cm. full of clear yellow fluid. Left ovary contains one simple cyst 2 x 2.5 cm. full of clear, yellow fluid. No corpora lutea found in either ovary. Microscopic diagnosis: myometrium negative. Simple cysts of ovaries."

In Group II ovulation is too frequent and therefore menstruation is too frequent. Too many corpora lutea are present and apparently ineffective as they are unable to prevent the greatly increased incidence of ovulation, which is a function of the normal corpus luteum (Loeb⁵). These corpora lutea are normal macroscopically and microscopically but have not retrogressed normally and this lack of retrogression plus the ineffective prevention of ovulation makes for the assumption that the corpora lutea are not physiologically normal. It is within reason to assume that extract of the corpus luteum might exert some influence upon the ovarian cycle if supplied in sufficient amount. This will be tried in cases in the Tumor Clinic as soon as enough pathologic material is at hand to substantiate Shaw. In a patient recently operated upon a preliminary diagnosis of Shaw's

Group II was made and the pathologic organs predicted. It was expected that an enlarged uterus, quite symmetrical would be found and definite atrophy of the ovaries with too many corpora lutea. At operation the demonstration of the lesion was quite dramatic for the exact pathology had been predicted. In this case also it was not considered advisable to remove both ovaries on account of the youth of the patient, but the uterus and the left tube and ovary were removed. The endometrium was slightly thickened and pink in color. It could be easily called watery looking. The left ovary contained a fresh corpus luteum and scattered throughout these atrophied, small, rough ovaries, stigmas of recent ovulations could be found. The pathologic report showed that too many corpora lutea were present. A photograph

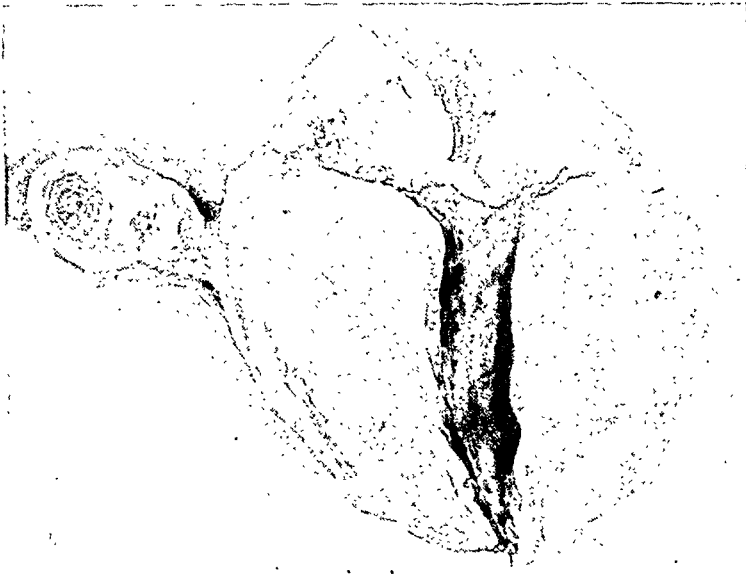


Fig. 3.—Photograph of the uterus and ovary, Case 3, Shaw's Group II. This shows the symmetrical enlargement of the uterus and the somewhat thickened endometrium. The ovary shows on its lateral surface a fresh corpus luteum bulging through the cortex. Some of the atrophic corrugated ovarian tissue can be seen medially.

showing the type of uterus and ovary found in this case is presented, also a drawing of the longitudinal cut section of the removed ovary showing three recent corpora lutea and one very new one close to the surface of the ovary. Below is the history and pathologic report of this case:

CASE 3.—Aged thirty-two years. For the past one and a half years this patient had severe uterine bleeding. She menstruated every two weeks, the period lasting six or seven days, and she used five napkins per day. She was quite thin and looked badly from loss of blood. Her periods previous to one and a half years ago were perfectly normal. She has had two children, both living and well. From the history of the case and physical examination she was placed in Shaw's Group II. A supravaginal hysterectomy was done, removing the left tube and ovary. The pathologic report follows showing the enlargement of the uterus and the report

of the definitely increased number of corpora lutea: "Specimen consists of a hemi-section of uterus. The endometrial surface is pinkish-red. The wall is 3 cm. thick at fundus, 1 cm. at internal os. The left tube and ovary are attached. The ovary contains a small cyst on surface with otherwise normal corrugations. Cut section shows 3 cysts with bright yellow walls 1 mm. thick, the largest 1 cm. in diameter and full of jellied, reddish colloid material. One small hemorrhagic cyst is also present. Microscopic diagnosis: chronic endometritis. Increased number of corpora lutea."

In discussing a recent paper by Fluhmann³ on the "Endometrium in so-called Idiopathic Uterine Hemorrhage," Ludway A. Emge's remarks throw some light upon Shaw's Groups I and II. He says: "If we exclude the inflammatory pathologic changes, we are left with an endometrial disturbance which singly expresses the end phase of a still unexplained functional disturbance. We may suspect its immediate origin to be a disturbance of the thyropituitary-ovarian interchange. The immediate effect is the resulting disturbance of the follicular apparatus of the ovary, which may manifest itself in the production of

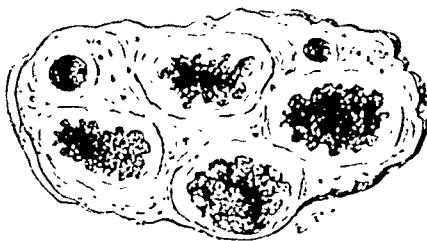


Fig. 4.—Cross-section drawing of ovary. The fresh and the three recent corpora lutea are clearly shown, demonstrating the fact that ovulation was too frequent in this patient who flowed every fourteen days.

one or more persisting follicles possessed of a prolonged stimulating action on the endometrial cycle, or in the faulty corpus luteum behavior, or both. The vascular manifestation, that is bleeding, is therefore only the end-result. Hyperplasia of the endometrium, as Dr. Fluhmann has pointed out, is not a constant factor and may constitute only a phase in the entire process, for we know that many hyperplasia found accidentally show no signs of bleeding."

In Group III it was evident to Shaw from the study of a few cases that the ovaries were grossly pathologic, they were large, intensely hyperemic and contained many follicular hematomas. No patient placed in this group before operation has been operated upon in the Tumor Clinic, but one case seen is probably of this type. The menstrual cycle of this patient is from three to six weeks apart with a large flow, and cases with this history are included by Shaw in his Group III. A case report follows:

CASE 4.—This patient, aged forty-five years, single, entered the hospital Dec. 31, 1928. She flowed in July, 1927, and then skipped until September, 1927, when she flowed two weeks and then skipped again until December, 1927. Her uterus was

hard, large, but in good position. Curettage done in January, 1928, showed nothing abnormal. She was again seen in August, 1929, as she had been flowing irregularly since operation every three to six weeks and having very large periods. She was curetted again in September, 1929, and normal endometrium found. At the present time she is having deep x-ray therapy in the hope that her periods can be stopped. This patient quite definitely falls into Shaw's Group III along with the patients who flow a great deal in irregular intervals of three to six weeks.

In Group IV the ovaries are definitely pathologic, being large, hyperemic and hyperplastic, the endometrium is intensely red and congested and there is enormous hyperemia. The corpus luteum is definitely abnormal, being large and cystic. Shaw states that the bleeding in this group is probably due to the congestion of the endometrium and that it is unrelated to menstruation. This congestion is that present at the time of follicle ripening and not the premenstrual congestion. Two cases of this type have been encountered. One patient's regular flow was very severe and corpus luteum and thyroid extract feeding have helped her a great deal. The other patient flowed between her periods for three to four months. Corpus luteum and thyroid extract have also helped her. Ten days after taking the medication the flowing ceased and her periods were straightened out completely for eight months. Later the same symptoms recurred and she is now taking corpus luteum again.

The above treatment was entirely empirical and was given because of the success in treating irregular uterine bleeding cases with it. This must be a rare group, but perhaps it is difficult to recognize. Two case reports of patients in Group IV follow:

CASE 5.—This patient, aged twenty-one years, without children, has had very severe bleeding. She is very thin and anemic. Her periods have always been either slightly early or slightly late. Her last period was one week early and accompanied by considerable pain. In taking her history she volunteered the information that she has had a pinkish to bloody discharge between her periods. Her period in August, 1929, lasted sixteen days and came a week early. Her September period was three days late and very severe. Blood studies were negative and her basal metabolic rate -3 . Examination showed a large uterus in good position. Both ovaries could easily be felt through the thin abdominal wall and they were of normal size and no cysts could be made out. She was given thyroid extract and corpus luteum and was seen again in October, 1929, when she looked and felt considerably better. Her period had lasted only three or four days and she stated that this was the best period she had had in a long time. She will continue with corpus luteum and thyroid extract through her next period. The intermenstrual discharge of pinkish to bloody material is characteristic of Shaw's Group IV.

CASE 6.—Aged twenty-one years, single. This patient gives a history of flowing between her periods for three to four months with occasional nausea and pain. Up to this time her periods were usually regular and normal in amount. She is very thin and resembles in some ways the previous patient. Examination showed a very large cecum full of fecal matter. Pelvic examination was not done because of an intact hymen. Rectal examination showed a small, freely movable uterus. She was given 15 grains of corpus luteum and 2 grains of thyroid per day and at the end of ten days her period stopped and for the next seven months her periods

were perfectly normal and regular. She took the corpus luteum and thyroid for about one month. She was seen again after the recurrence of her irregular bleeding seven months later. She had flowed for about ten days between periods and had repeated by flowing a week following the cessation of the next period. She had some nausea and abdominal pain: Examination showed the same findings except for a question of an enlarged right ovary. She was given corpus luteum without thyroid this time.

Of Group V, the additional group of patients with endometritis, there can be no question. Numerous instances of this type have been encountered in hospital and private practice, most especially in the acute stages, either of puerperal or gonorrheal infection. No case reports of this type of bleeding are included in this paper.

The cases described and investigated by Shaw are known under many different names, such as subinvolution of the uterus, fibrosis of the uterus, uterine insufficiency, arteriosclerotic uteri, etc. The so-called bleedings due to menopause changes are also included in the groups. Bleeding attributed to hyperplasia or hypertrophy of the endometrium is in many instances of this type.⁷ His report, therefore, has wide significance for a reasonable explanation is offered to explain the abnormal bleeding of many patients.

It is quite evident from attempting to classify cases seen in the Tumor Clinic that cases seen previously cannot be reclassified because of the inadequate histories.

All cases cannot be grouped and with more and more experience in attempting to do so the problem becomes even more difficult. Perhaps with more study of the histories and pathologic findings it may become easier but already cases have been seen and studied from all angles that cannot be placed definitely in any one group. However, Shaw has presented a structure to build upon and some cases definitely fall into his classification as seen in this clinic. It is therefore felt that more work must be done upon this problem as he sees it. Cases of thrombopenic purpura and of atypical purpura that occasionally are met with cannot be grouped into this classification and they may account for some of his unexplained 17 per cent.

It must not be forgotten in the enthusiasm to group, understand and perhaps treat medically these cases, that most of them are in the cancer age and that above all they must of necessity be examined under ether and curetted and the tissue microscopically examined. Gland treatment may be tried in a few cases but the great majority will eventually fall into the hands of the surgeon and radiologist.

SUMMARY

1. This paper was written with the hope that a summary of Shaw's work and case reports of the types of cases he has described would familiarize the medical profession with his research. His paper is very much worth reading and studying.

2. Cases of irregular uterine hemorrhage have been divided into groups in which the histories, physical findings, and pathologic material are similar.

3. Suggestions as to the cause of bleeding are given by Shaw.

4. It is quite possible that corpus luteum therapy may have a reasonable basis.

5. Three cases are presented with histories and pathologic findings identical with those described by Shaw. Three other cases with histories similar to those found in his Group III and Group IV are presented.

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Neverman, H.: The Fate of the Eclamptic Patient. Arch. f. Gynäk. 129: 891, 1927.

The author was able to trace 60 of the 291 eclamptic patients who were treated at the Hamburg clinic. Of these, 27 had no complaints and were apparently well; 13 complained of persisting headaches; 12 of weakness of memory; 4 of visual disturbances; 5 of edema of the legs; 3 had no complaints, but upon examination, likewise showed findings which could be attributed to damage to the central nervous system by the eclampsia. Eight had a definite hypertension and three had albumin and casts in the urine. These latter were unquestionably cases of recurrent nephritis. No patient was found to be suffering from chronic nephritis. The renal changes which persist after the eclamptic patient has recovered are probably nephritic in type and involve the tubules. Definite changes must take place in the blood vessels and in the vasomotor system to produce the persistent hypertension.

Following their attack of eclampsia, eight patients had had one normal pregnancy, one had had two pregnancies, and one had gone through five pregnancies. Four of these women showed edema during their pregnancies and in four there was a second eclampsia present. In one of the latter, eclampsia had recurred in two successive subsequent pregnancies. Eclampsia is, therefore, prone to recur and a former eclamptic patient must be carefully watched in subsequent pregnancies.

RALPH A. REIS.

TUBAL STRICTURES AND THEIR LOCALIZATION BY MEANS OF UTEROTUBAL INSUFFLATION AND THE KYMOGRAPH*

WITH NOTES ON THE COMPARATIVE VALUE OF LIPIODOL†

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UTEROTUBAL insufflation was originally planned as a nonsurgical method of determining the patency of the fallopian tubes and was presented in April, 1920, before the section of Obstetrics and Gynecology of the American Medical Association.¹ It was offered as an improvement over the intrauterine injection of collargol and the x-rays, a method with which Cary² and I had independently acquired some experience six years before.^{3, 4}

The replacement of collargol was prompted by the fact that collargol caused inspissations in patent tubes which might produce occlusion. There were also unpleasant pelvic peritoneal reactions which followed the introduction of collargol into the peritoneal cavity. These two disadvantages which were observed in a few cases weighed against its general adoption as a specific diagnostic procedure.

To obviate the inspissations I tried to substitute clear solutions for collargol, using first thorium and then sodium bromide. The peritoneal reaction from these solutions was also unpleasant if not as severe as when collargol was used. This led me to seek a substance which could be used to determine patency of the tubes and which at the same time would leave neither residue in normal tubes nor cause peritoneal irritation.

Oxygen appeared to meet these demands and was the first gas to be employed for that purpose. Soon after Stein and Stewart⁵ had demonstrated the production of pneumoperitoneum by injecting oxygen through the anterior abdominal wall, I conceived the idea of introducing this gas through the uterus. Its specific object however was to demonstrate tubal patency. The resulting pneumoperitoneum "was conclusive in proving the patency of the genital canal from the external end to the internal abdominal end. This, however, could result only when one tube was patent and the other closed, as well as when both tubes were patent." To quote further from the same paper, "For practical purposes in the consideration of sterility it suffices that one fallopian tube is patent. Future observations may make it possible for us to draw definite conclusions on the question of unilateral or bilateral patency, and, if unilateral which side is open or closed."¹

*Read at a meeting of the Brooklyn Gynecological Society, February 7, 1920.

†The material on which this study is based is derived from the sterility clinic of the Gynecological service at Mt. Sinai Hospital, and from private practice.

Failure to produce a pneumoperitoneum must necessarily indicate a blockade in both tubes. Since it was thus possible to demonstrate patency as well as nonpatency I abandoned for the time being earlier attempts made six and five years before with solutions opaque to x-ray. In view of the wider adoption of such solutions in more recent years, it is of some interest perhaps to quote from the same paper. "In the nonpatent cases one may also use thorium or bromid as a control. The citrate thorium solution or sodium bromid solution may be injected into the uterus, and under obturation the roentgenogram may be made. I did this a few times in the earlier experiments but have been able to dispense with it in my later work."¹

Increasing experience with uterotubal insufflation enabled us to note that the gas before it passed through the tubes into the peritoneal cavity was subjected to different degrees of pressure. The significance of the varying pressures was better appreciated as time went on. Carbon dioxide gas was substituted for oxygen as it was very much more quickly resorbed and because it minimized the resulting shoulder pains.

Since the adoption of a kymograph in 1925 to note the reactions of the fallopian tubes to the insufflated gas, many new facts have been brought to light that could not have been ascertained before. Through numerous experiments upon animal tubes and upon human uteri and tubes it became possible to answer the question of first importance, namely, *what is normal patency?* It soon developed that normal tubes exhibit peristaltic motions which vary with the phase of the menstrual, i.e., ovarian cycle. From three to four peristaltic movements per minute in the interval stage to several more impulses in the ovulation or midintermenstrual phase were noted in experiments with strips of tubes.

When tested clinically these peristaltic motions are demonstrable upon the kymograph. In normal cases patients do not feel the slightest pain reactions referable to the tubes themselves. At most they complain of a sense of discomfort in the suprasymphyseal area referable to the uterus which is momentarily distended. The slight discomfort lasts for the brief period before the gas passes through the uterotubal junction (the first physiologic barrier) and diminishes as the gas passes through the fallopian tubes into the peritoneal cavity. Frequently the patients state they have an "unwell feeling" quite similar to the menstrual moolimina. In many cases even this slight discomfort is absent.

In the presence of some stenosis or stricture of the tube on the one or other side, there is as a rule some pain referable to the tube affected if unilateral and to both if the stenosis is bilateral.

Attention was called to this phenomenon in a volume on *Symptoms in Gynecology*, published in 1923, before the kymograph was available.⁶

With the aid of the kymograph we may diagnosticate various degrees and types of tubal abnormality. The use of lipiodol, iodipine, etc., has further enabled us to check up the interpretations of the findings with uterotubal insufflation in the nonpatent cases and in those with a high grade stenosis. The superiority of these iodized oils over collargol and iodine or bromide in solution was realized soon after Siccard and Forestier's publication in 1923.⁷ Lipiodol was employed by us for fluoroscopic visualization of the tubes in an attempt to study their physiology and for purposes of comparison with the findings obtained by the gas method.⁸

A comparative study of lipiodol and CO₂ uterotubal insufflation in 66 cases of tubal obstruction was made by me and presented by proxy at New Orleans, December, 1927.⁹

Though a résumé of that paper should prove of considerable importance in connection with the present topic it will suffice at this time to give the concluding paragraphs: "CO₂ uterotubal insufflation has proved to be superior to lipiodol in demonstrating (a) uterotubal spasm, which can be graphically recorded by the kymograph; (b) in demonstrating the presence and type of tubal peristalsis *with uniformity* in patent tubes; and (c) in revealing the presence of tubal adhesions which do not completely constrict the tube lumen. The salpingograph can reveal the first point of occlusion of the tube lumen but not the presence of tubal adhesions which may bind the tube externally without obliterating the canal. Tubal peristalsis which is altered under these conditions can be demonstrated by the kymograph. Occasionally in the hands of an expert the diagnosis of tubal adhesions will be ventured. My associate in this x-ray work, A. J. Bendick, has reported the finding of tubal adhesions on two or three occasions."

It is of interest in this connection to quote from H. Sellheim who has had a large experience with uterotubal insufflation. Sellheim states that "roentgenography of the fallopian tubes has not shown us more than insufflation as far as patency or nonpatency is concerned. Roentgenography is however the only means, at least, by which in many cases we may obtain some idea of the site of the obstruction so that before doing a laparotomy we may know whether we may have to do a salpingostomy or tubal implantation depending upon whether the obstruction is at the fimbria or at the isthmus."¹⁰ I have been particularly interested in seeing whether it was not also possible to determine this point by uterotubal insufflation. Based on increasing experience with uterotubal insufflation I have been able to call attention to the diagnosis of the site of tubal obstruction; i.e., at the uterine end and at the fimbria, without resorting to the use of intrauterine iodized oil injection.^{11, 12}

The present paper is concerned with further studies in the localization of strictures in the fallopian tubes by means of uterotubal insuff-

flation and the kymograph. Additional notes on the comparative value of both methods have been included in this study.

The technic of uterotubal insufflation has improved from a somewhat crude first effort to its present development. The apparatus employed to test tubal patency now includes a kymograph in addition to the quantimeter and manometer. The fluoroscope is still a useful adjunct which I have resorted to constantly for accurate control. The kymograph however has practically enabled me to dispense with the fluoroscope in normal patency. Thanks to these aids the interpretation of the findings has led to more refined diagnosis. Thus not only is an answer available to the question whether in a certain case the fallopian tubes are open or closed, but also if patent, to what degree they are open. For it must obviously make a difference whether a pressure of 40 or 60 mm. Hg or one of 200 mm. Hg or more is necessary to open the tubes. Thus data of prognostic value in a given case of sterility are added to the diagnostic value.

There were 650 cases of sterility examined with the kymograph up to May, 1927.¹² Four hundred sixty-five cases or 71.5 per cent proved to have tubal patency of all degrees. There were 185 cases or 28.5 per cent which proved to have non-patent tubes.

Of the 465 cases with tubal patency, 275 could be considered normally patent. In 78 cases patency was somewhat impaired, i.e., pressures were from 90 to 150 mm. Hg. In 24 (4 per cent) there was an element of spasm, hypertonicity, i.e., the pressures ranged between 150 to 200 mm. Hg.

In 52 cases the diagnosis of slight peritubal adhesions was ventured; the pressures ranged between 90 and 150 mm. Hg and no manometric fluctuations were recorded on the kymograph.

In 36 cases (5.5 per cent) there was evidence of high grade stricture, the pressures ranging between 150 and 200 mm. Hg and no manometric fluctuations were recorded on the kymograph. In all these cases a subphrenic pneumoperitoneum proved patency.

In the majority of instances where patency at high pressures was observed, i.e., cases of high grade tubal stricture, the insufflation was repeated no more than two times. In a few cases it was repeated three or more times when the patient wished to avoid operative intervention and hoped for some therapeutic result from the insufflation. The occasional successful case encountered under these circumstances encourages one to persist when, other factors being equal, there is nothing left to help these patients with tubal strictures. The extrinsic strictures are more apt to yield than the intrinsic.

The kymographic record of nonpatency is characteristic and never varies. There is a gradual steep ascent to 200, the highest point experience has taught to be safe. At this point the gas valve is shut. The tracing then becomes horizontal and falls sharply when the release valve is opened or when the cannula is removed from the uterus.

In normal patency the pressure rises to any point well below 100, drops sharply 10 to 30 mm. Hg and rises that many mm. or more or less, falling again successively three to four times per minute as a rule in the postmenstrual phase when the method is most properly used. The initial pressure rise depends upon three factors: (1) the rate of speed of the gas flow; (2) the muscular resistance or tonicity of uterine wall; and (3) the uterotubal sphincter. As the rate of flow can be a constant factor (say in the ratio of thirty seconds for each siphon pulsation of the automatic volumeter employed in the apparatus) the uterine wall tonicity and sphincter tone can be readily determined in terms of mm. Hg.*

When a permeable stricture is present the initial pressure rises as a rule to more than 100 mm. Hg and instead of dropping sharply and exhibiting oscillations the kymographic tracing shows definite deviations. The descent of the curve from the initial drop is more gradual. It may exhibit slight oscillations at first or none at all; or it may upon reaching a much lower level, maintain a more or less horizontal line or even exhibit slight fluctuations resembling those encountered in normally patent tubes. Frequently the drop of the pressure is so gradual as to describe a parabolic curve. In such cases oscillations are less likely to occur.

In the presence of spasm the initial rise of pressure is high, up to 150 mm. Hg or more when a sudden drop is noted varying between 50 and 100 or sometimes more mm. Hg in depth, after which normally appearing oscillations come into evidence.

A combination of spasm with stricture can occur but this is not very frequent. As a rule the strictured tubes will produce kymographic tracings during uterotubal insufflation that are characteristic.

The depth of the subphrenic pneumoperitoneum, other things being equal, is a practical guide as to the type patency, i.e., the degree of stenosis present. If, for example, 120 c.c. of gas will produce an *immediate* subphrenic pneumoperitoneum represented by a meniscus under the diaphragm of one to one and one-half inches in a woman five feet, four inches, weighing one hundred thirty pounds, the same amount of gas in a person of equal height and weight whose tubes are strictured will produce a meniscus of approximately one-fourth to one-half inch in depth. The gas bubbles forced at the high pressure through a small aperture are necessarily smaller on the one hand, while on the other a good deal of the gas will be regurgitated back from the cervix and hence will not reach the peritoneal cavity. In a few instances part or whole of the gas volume is caught by adhesions

*What particular importance the variation in uterine tone can have with respect to fertility and gestation cannot yet be stated. From personal experience there are indications that uterine tonicity is influenced in part at least by hormonal activity of the ovaries. But this will be developed at length in a future paper.

in the pelvis surrounding the tubes and ovaries and thus fails to rise to the diaphragm altogether. Some of the gas may reach the subphrenic space after a delay of several or more minutes.

By observing the pain reactions to the insufflation we can determine whether the site of obstruction is on the one side or other, or both. The patient often does not stress her sensory experiences. It is therefore necessary always to ask her to describe them carefully with reference to location and distribution.

In this respect we may recall the character and distribution of intestinal distention, the location of the colic and pain radiation. We may also recall the pain produced by enemas and the relief that fol-

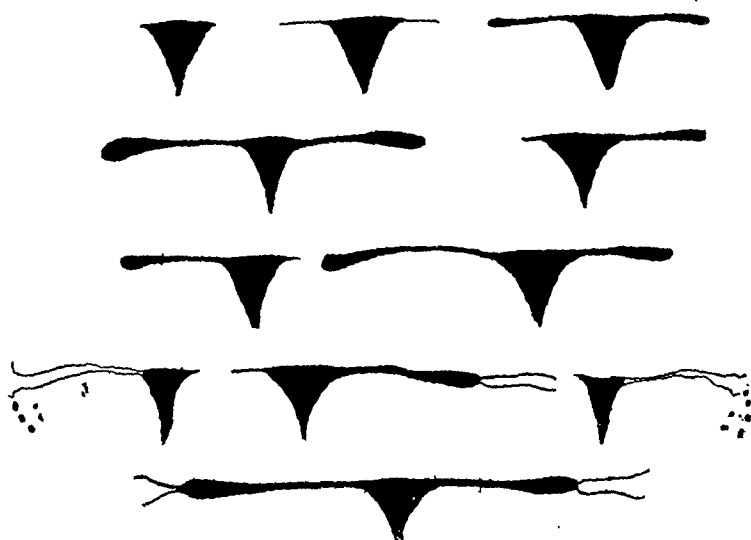


Fig. 1.—Types of tubal closure and stricture; bilateral, unilateral, symmetrical, and asymmetrical.

lows the evacuation of the colon. An exquisite analogy can be drawn from the injection of solutions into a ureter in order to determine its capacity. The pain due to ureter and kidney pelvis distention is prompt and characteristic and disappears as soon as pressure is released. The pain characteristic of tubal pregnancy is too well known to require description here.

It has been noted that when the obstruction is bilateral, the pelvic pain is bilateral during uterotubal insufflation. When it is unilateral the pain is unilateral. There are few exceptions to this rule.

In general, the points of obstruction are at the uterotubal junction, in the isthmus, at the isthmicoampullary junction, at some point of the ampulla, or at the fimbria. The stricture may be bilateral and symmetrical or asymmetrical or altogether unilateral. One tube may be freely patent while the other may be absent through operative ablation, or congenital failure, or the tube may have a stricture at one of the points mentioned above. (Fig. 1.)

In approximately the last 60 cases of tubal obstruction previously determined by uterotubal insufflation which I have checked up by lipiodol injection the diagnosis of the site of obstruction was made before the lipiodol was injected. In order to compare the findings with each method I have drawn shadowgraphs showing the points of obstruction as found by uterotubal insufflation. They were then compared to the skiagraphic shadows obtained with lipiodol.

Localization of the different sites of stenosis or obstruction by means of uterotubal insufflation.

The data with regard to strictures are based for the most part on observations made upon patients coming for the relief of sterility as follows:

1. Those who have had one fallopian tube removed for some reason or other and the operative note is so recorded.

2. Those where a conservative operation was done upon one or both tubes, the facts being known concerning the nature of the procedure and the point of resection.

3. Patients operated upon after CO₂ uterotubal insufflation have demonstrated a stricture and later controlled by another or several insufflations. The findings at the operation can check the interpretation made preoperatively.

4. Cases in which the tubes have been ligated and the test is carried out to make certain of impermeability. In a few cases I have purposely applied the ligature at uneven portions of the tubes in order that I might note the pain reactions on both sides when the test for patency is done at some time after the operation.

5. Cases in which without previously being insufflated, the tubes and ovaries were freed from adhesions in the course of some other pelvic operation.

6. By controlling the insufflation findings with lipiodol injections.

7. Finally, by experimental duplication of adhesions and strictures on surviving extirpated uteri and tubes.*

IMPERMEABLE STRICTURES

I. Bilateral and symmetrically located obstructions.

A. Total obstruction at uterotubal junctions.

- (1) The pressure reached is 200 or more; there is no drop after the gas valve is shut. The curve runs horizontally and drops sharply vertically as soon as the cannula is removed or the release valve is opened. The CO₂ cannot be demonstrated by fluoroscopic examination. There are no shoulder pains.

- (2) Distention pain is complained of and is referred to the midline, in the suprasymphyseal area. There is no lateral radiation of the pain. The insufflation may be repeated once or twice at the same sitting, not only to corroborate the first finding of pressure and pain reactions but also to eliminate the element of spasm which may be present.

*These will be published separately in the near future.

B. Total obstruction at the isthmus.

- (1) Same as (1) in A.
- (2) Pain is somewhat lateral, the midline pain also being present and prominent. The nearer the ampulla to the site of obstruction the more constant is the presence of lateral pain.

C. Total obstruction at ampulla.

- (1) Same as (1) in A.
- (2) Pain radiates well out to sides. The nearer the fimbria to the site of obstruction the more marked is the pain.

D. Total obstruction at the fimbria.

- (1) and (2) practically as in C. Pain may radiate to lumbar region and sometimes down one thigh or the other.

When the site of obstruction is asymmetrical the pain reactions generally hold true according to the above.

The amount of distention with gas is obviously not as demonstrable radiographically¹³ as when lipiodol is used but the character of the pain and its distribution often enable us to estimate that point. Occasionally I have palpated a somewhat distended but flaccid tube immediately after the insufflation.

When total, i.e., bilateral tubal obstruction of the tubes is present, there is practically no difference in the interpretation of the findings whether insufflation or lipiodol is employed.

PERMEABLE STRICTURES

In the permeable strictures a good deal depends upon the amount of pressure employed with either method. As has been shown¹¹ when greater pressure is used with lipiodol one can succeed in forcing the oil into the peritoneal cavity and the same holds true for gas. In repeating insufflation either at the same examination or subsequently one succeeds not infrequently in forcing the gas through a tight stricture by raising the pressure 10 to 20 or 30 mm. Hg. The amount of pressure required when lipiodol is injected in similar cases is considerably greater.

The striking departure between both methods is seen in instances of permeable strictures. If lipiodol is injected without manometric control and the oil globules are seen upon the x-ray film as having entered the peritoneal cavity it demonstrates nothing more than by the crude method of transuterine tubal inflation as first done by myself and others. The manometer after all does add to our knowledge of the tightness of the stricture or the adequacy of the tube lumen. If the injection of lipiodol or iodized oil is not controlled fluoroscopically and the plate is not made immediately with the uterine cannula in situ, one cannot say which tube is open and which may be closed. Nor can permeable strictures be determined by means of lipiodol unless constant fluoroscopic examination is made and supported by x-ray films taken at stated intervals afterward.

A very striking proof of the patency of the tube is the fluoroscopic visualization of *the spurt of the oil through the fimbriated end* in a manner similar to the escape of urine into the bladder from a ureteral orifice. This is occasionally observed and under such circumstances the tube may be definitely considered patent. The question of stricture is however not so readily settled. The localization of permeable stricture can, if great care be exercised, be demonstrated by lipiodol injection under most painstaking fluoroscopic and manometric control. It must be remembered however that the oil after passing through the stricture reaches the abdominal cavity and must finally be taken care of by the peritoneum. In actual experience not a small proportion of patients complained of abdominal cramps for twelve to twenty-four or more hours following lipiodol injection, an experience which is extremely rare when carbon dioxide gas is used. The offensive odor of the vaginal discharge which may last for twenty-four or forty-eight hours is also a disadvantage.

Comparable to the spurt of oil which one can see by carefully watching with the fluoroscope, is the characteristic sound heard with the stethoscope as the CO_2 escapes from the fimbriated end into the general abdominal cavity. (Henderson and Amos.¹⁴) This is constantly to be heard in the patent cases. Abdominal auscultation is considerably easier to carry out and can be done by the examiner. The heavy weighted stethoscope devised by M. Leff is very serviceable. When as occasionally happens, the gas is caught by pelvic adhesions it becomes fairly rapidly absorbed and leaves no trace in a few hours. The same cannot be said of lipiodol. When pelvic adhesions are not present and do not catch the gas the latter rises at once to the subphrenic space where it is rapidly resorbed.

Here it may be well to point out that the side upon which the subphrenic pneumoperitoneum appears is not diagnostic of patency of the tube situated on the corresponding side; because a right tube may be patent with the gas appearing under the left diaphragm and a left tube may be patent with the gas appearing under the right diaphragm; or both tubes may be patent and the gas appear only on one side or the other. Frequently the gas will be seen under both halves of the diaphragm. When the meniscus is seen under the left diaphragm I have been in the habit of putting the patient upon her left side while making pressure over her right chest. This forces the gas to rise to the right side and may readily be seen as a right-sided subphrenic pneumoperitoneum. Unless one is experienced in differentiating the gas bubble almost constantly present in the stomach one may mistake it for a left-sided subphrenic pneumoperitoneum. It is best therefore when in doubt to resort to that change in posture because gas under the right half of the diaphragm cannot be mistaken for anything else.

Another type of tubal abnormality which cannot be so readily diagnosed by lipiodol injection is presented by peritubal adhesions. These do not necessarily act as a barrier to lipiodol or gas under pressure but the physiologic condition of the tubes is so altered as to have an important bearing upon the question of fertility or sterility. Thus the pressure required may be 100 or a little higher or lower but the tube is bound down by adhesions that prevent it from exhibiting normal peristalsis. The two types of motility which normal tubes exhibit under purely physiologic conditions are the typical vermicular motion and the lateral swaying or writhing movement.⁸ These tubal movements have been observed with the fluoroscope in the living subject and in experiments with freshly extirpated and surviving specimens of uteri and tubes.¹⁵

Tubal peristalsis can of course be demonstrated by repeated x-ray plates (several per minute) to "catch" the tube in the peristaltic motion. It requires an extremely well-trained and patient roentgenologist. Moving x-ray films would be of decided help in this respect. There can be no doubt that this will be accomplished in the future. Its scientific value is unquestioned. Practically and economically it is another matter.

A satisfactory idea of the behavior of the tubes during insufflation is at once given by the tracings which are automatically recorded by the kymograph. By comparing the peristaltic waves of normally open unhampered tubes we may get a good idea of what takes place when the tubes are bound down by adhesions. The character of the curves is altered depending upon the density and extent of the adhesions. . . . The tubes under these conditions are "bridled" as it were and are prevented from exhibiting normal peristaltic motions which begin as a rule at the fimbria and proceed toward the uterus.

The question arises concerning the combination of one normal and one abnormal tube. If one tube is normally patent the gas passes the uterotubal junction of that side below 100 mm. Hg and as it passes through the lumen of the tube it is compressed upon by the waves of peristalsis normally present. These are evidenced upon the kymograph. By auscultating one can get a bruit most pronounced as a rule on the side which is normally patent. *This bruit is intermittent in character in normal tubes*, the silent pauses being synchronous with the rises of pressure which are in turn synchronous with the contraction phase of the peristalsis. With each relaxation the bubbles are propelled through the fimbria producing the gurgling sound on the side from which the gas escapes. If no sound is heard upon the other side it is presumptive evidence that some obstruction exists there. Unfortunately the sound is transmitted from the normal to the abnormal side so commonly as to make this physical sign unreliable for judging patency of both tubes. *If the sound is more continuous how-*

ever on one side it indicates a permeable stricture. The gas escapes from the fimbriated end under continuous pressure which is only mildly affected or not all modified by the very much impaired contractions of the tube. If in addition pain is felt by the patient on the side where this continuous bruit is heard it indicates also a certain degree of distention. The pain will scarcely be felt when the obstruction is complete and is located at the isthmus. Pain is, as a rule, greater when the permeable stricture is situated near the fimbria or ampulla.

This combination of one normal tube and the other strictured but permeable may be ascertained by lipiodol injection only when controlled by careful and constant fluoroscopy and by taking repeated plates. Unless this is done carefully the oil may enter the peritoneal cavity and appear on the film without leaving a clue as to the side in which the normal tube lies. Unless the abnormal tube is tortuous and dilated, the lipiodol can be expelled through the uterus by peristalsis and may not be visible in the plate. If the oil is finally seen in the free peritoneal cavity after several plates have shown the same or practically the same dilatation and tortuosity of the tubes, the diagnosis of permeable stricture is justifiable. (A. J. Bendick.)

In the last analysis the effort involved in elucidating this point is more of academic than of practical interest because it is clear that when one tube is normally patent pregnancy is possible. It is true however that such an individual's chances of becoming pregnant are reduced by half. Bilateral strictures with diminished patency necessarily reduce fertility in direct proportion. The extent to which the presence of a permeable stricture and its location can be determined by uterotubal insufflation is illustrated by two cases just recently examined also by lipiodol injection. A third case of nonpatency is added for contrast. It was examined the same time. Differential points are especially noted.

CASE 1.—(L. G.) First insufflation May 9, 1928 (Fig. 2), showed shallow fluctuations of 5 mm. Hg in depth. Initial drop at 75; drop not sharp. Second insufflation January 30, 1930 (Fig. 3). Pressure rose to 210 first attempt, describing a horizontal line at that level. Second attempt: initial rise to 135 mm. Hg, began describing a parabolic curve at 100 mm. Hg; practically no fluctuations. Points (X) (see Fig. 3) indicate pulsations of siphonometer. Pain was complained of on both sides. On abdominal auscultation gurgling was heard at 100 mm. Hg on the right side and continued as long as the gas passed through. There was very faint regurgitation from the cervix and gurgling was audible on the left side of the abdomen as well.

Diagnosis.—Stricture of right tube with patency. Because of cervical regurgitation and the possible transmission from right to left side the sound heard later on the left side could not definitely be ascribed to the gas escaping from the left tube; 6 excursions at thirty-four seconds each. Fluoroscopy showed 2½ inch depth subphrenic pneumoperitoneum on left side at first, then transferred to right side by posture. Lipiodol injection January 31, 1930 (Fig. 4), by Dr. A. J. Bendick; 4 c.c. of lipiodol used. Pain severe on left side, less on the right side. Right

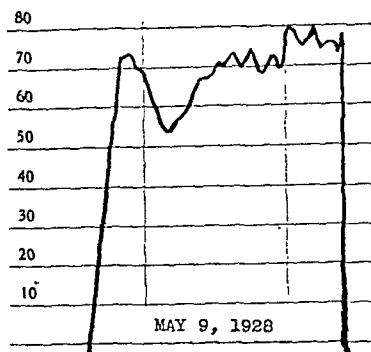


Fig. 2.—Insufflation with initial pressure rise to 70, showing shallow fluctuations 5 mm. Hg in depth.

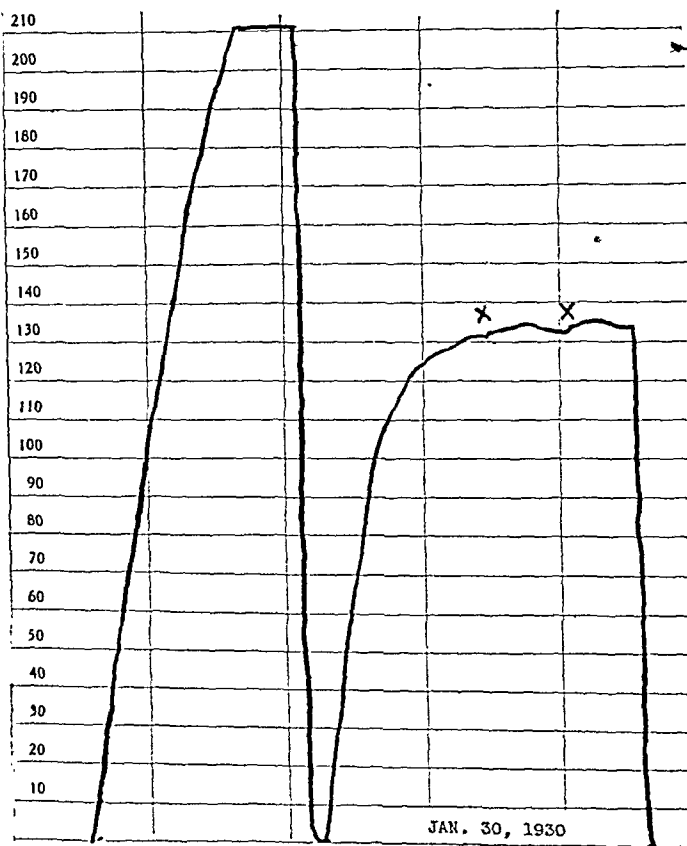


Fig. 3.—Insufflation; gas passed through second attempt in a parabolic curve from 120 to 135 mm. Hg.



Fig. 4.—Cannula in situ under pressure.

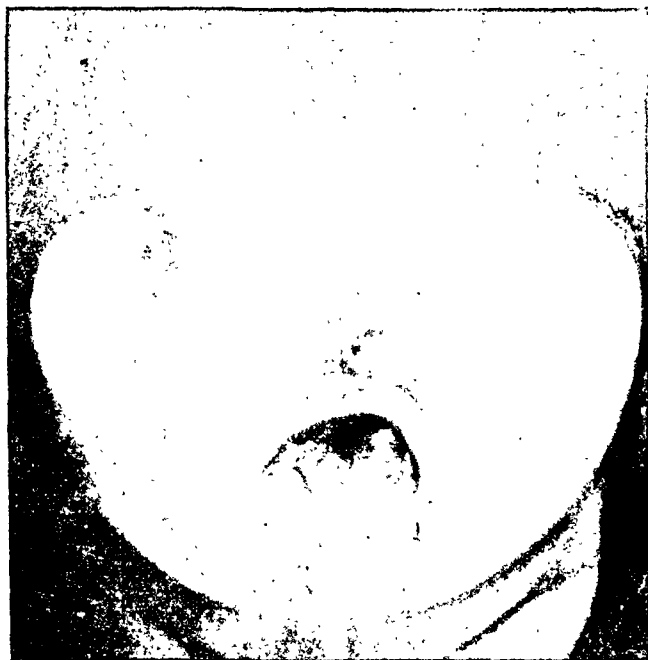


Fig. 5.—Film taken one-half hour later; lipiodol in peritoneum.

ampulla visualized; left tube not at all. Pressure up to 200 mm. Hg for one second as pain was severe. Right tube did not appear under the fluoroscope until the pressure reached 200 mm. Hg. Dr. Bendick's report: "The isthmus of the right tube is seen, it is long, measuring about $2\frac{1}{2}$ inches in length and appears normal. The ampulla is fairly well filled; it does not appear dilated and shows peristalsis. At no time did any lipiodol enter any part of the left tube. A film taken one-half hour later (Fig. 5) showed a moderate amount of lipiodol out in the peritoneal cavity in the vicinity of the right ampulla. Traces were seen in the uterus; none in the left tube. A film taken eighteen hours later (Fig. 6) showed some lipiodol scattered in the free peritoneal cavity and none in the uterus or either of the tubes. These findings indicate the right tube to be normal in contour and patent; the left tube to be blocked at the uterine end."



Fig. 6.—Film taken twenty-four hours later; lipiodol in peritoneum.

Comment.—Had the pressure been sustained with lipiodol the oil might also have entered the left tube. Apparently greater pressure is required to overcome a tight stricture with lipiodol than with gas. The permeability of the left tube in this case remains in doubt in spite of the lipiodol findings.

CASE 2.—(B. S.) Insufflation July 11, 1929 (Fig. 7), rose to 155 mm. Hg, describing a somewhat parabolic curve; slight bubbling regurgitation from cervix. Subphrenic pneumoperitoneum one-half inch meniscus on both sides. Pain in mid-line and slight pain on the left side. Two and one-half excursions at thirty-six seconds each.

Diagnosis.—Stricture of left tube with patency. Insufflation January 30, 1930 (Fig. 8), pressure rose to 160 mm. Hg, practically as on first insufflation, dropped gradually to 130 mm. Hg, without describing fluctuations, when the rate flow was changed from twenty-nine seconds to thirty-nine seconds per siphon excursion. It then dropped to 65 mm. Hg without describing fluctuations. Altogether $3\frac{3}{4}$ excur-

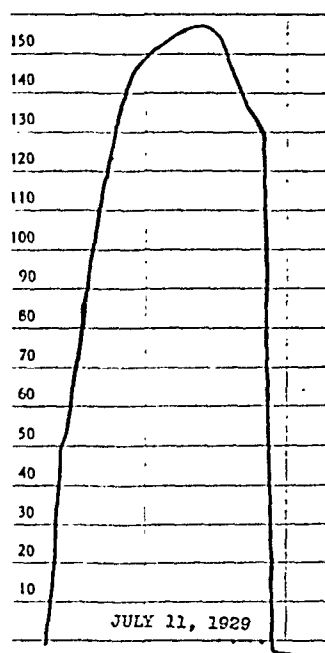


Fig. 7.—Insufflation; initial pressure rose to 155 mm. Hg, describing a somewhat parabolic curve.

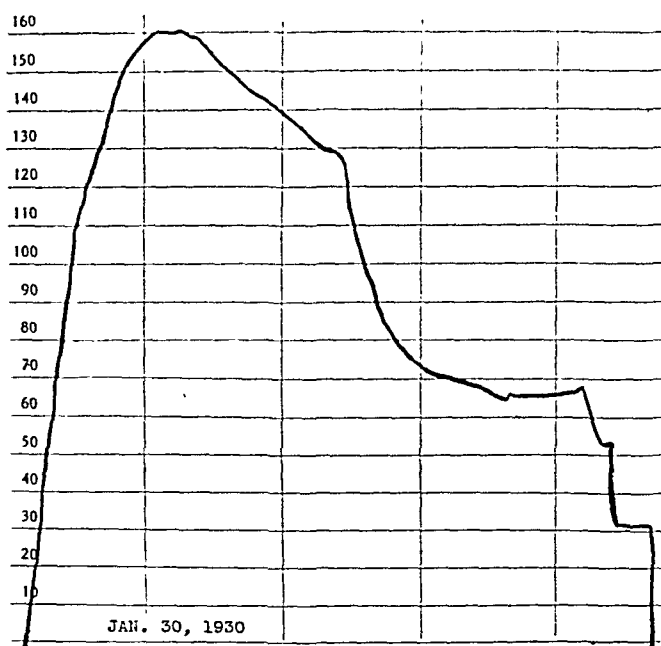


Fig. 8.—Insufflation; initial pressure rose to 160 mm. Hg, describing a somewhat parabolic curve and dropping gently to 130 mm. Hg.

sions at twenty-nine seconds each and two excursions at thirty-nine seconds each. Pain was felt on the left side. Abdominal auscultation elicited constant gurgling from the tube on the left side. Fluoroscopy showed a left-sided pneumoperitoneum; pressure was increased to 200 mm. Hg with the lipiodol. (Figs. 9, 10, 11, and 12.)



Fig. 9.—Cannula in situ under pressure.

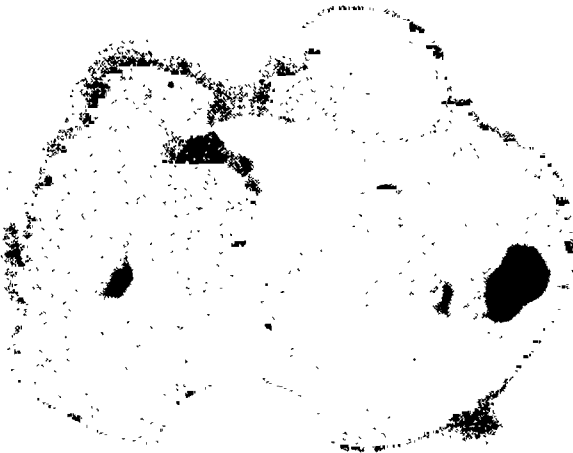


Fig. 10.—Pressure increased to 200 mm. Hg.

It certainly required more than one-half hour and possibly a few hours for the lipiodol to work its way through the stenosed lumen of the left tube, again demonstrating the greater amount of pressure required to overcome a strictured tube by lipiodol. The film taken five days later (Fig. 13) still showed a large quantity of lipiodol at the stenosed fimbria of the left tube. The point of stricture however in



Fig. 11.—Film taken one-half hour later.



Fig. 12.—Film taken eighteen hours later.

the patent tube was at once evident on auscultation when CO_2 was used, the gurgling being heard over the left lower abdomen and not transmitted to the right lower abdomen in this case. The absence of an audible bruit on the right side indicated occlusion of the right tube at a pressure of 160 mm. Hg.

CASE 3.—(E. D.) Insufflation December 12, 1929, pressure rose to 205 mm. Hg, slight regurgitation from cervix causing a slight bend in the upward tracing and a sharper decline when the valve was shut from points A to A' (Fig. 14). A second attempt showed even a more pronounced bend in the upward tracing due to the cervical regurgitation. Subphrenic pneumoperitoneum is absent. Pain in midline.

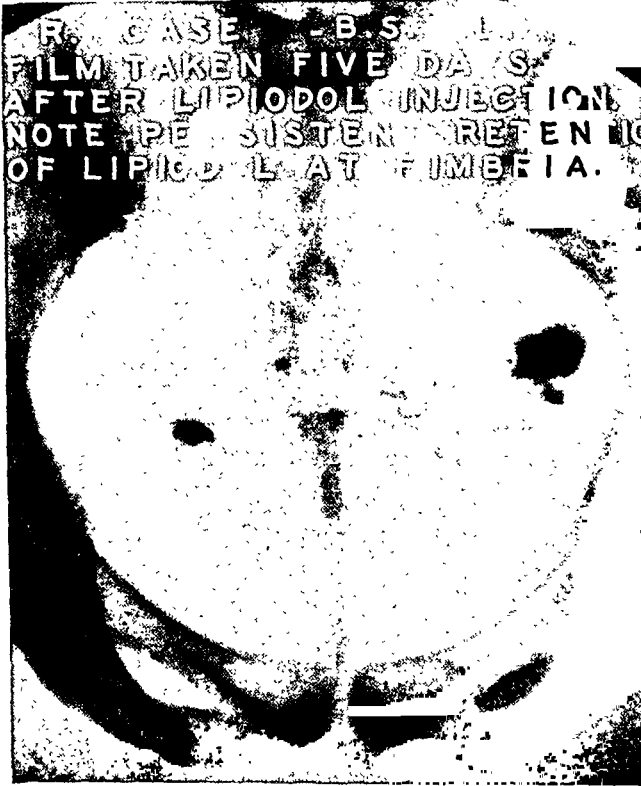


Fig. 13.—Film taken 5 days later.

Diagnosis.—Bilateral obstruction at the uterine end of the tubes.

A second insufflation, January 2, 1930, with cannula held more firmly in cervix, preventing cervical regurgitation; pressure rose in a straight line to 195 mm. Hg, and was maintained with the slightest fall due to very faint regurgitation from the cervix. Pain felt slightly to left, mostly in midline, and slightly to the right. Subphrenic pneumoperitoneum negative.

Diagnosis.—Bilateral stenosis at isthmus.

January 31, 1930, lipiodol injection by Dr. Bendick; 7 c.c. lipiodol used. Uterus filled at 40 mm. Hg. Pressure increased to 200 momentarily. The isthmus of the right tube was outlined for a distance of three-fourths of an inch where it ended rather abruptly. (Fig. 15.)

Comment.—When the stricture is situated within the isthmus a short distance from the uterine ostium, lateral pain during insufflation is not likely to occur.

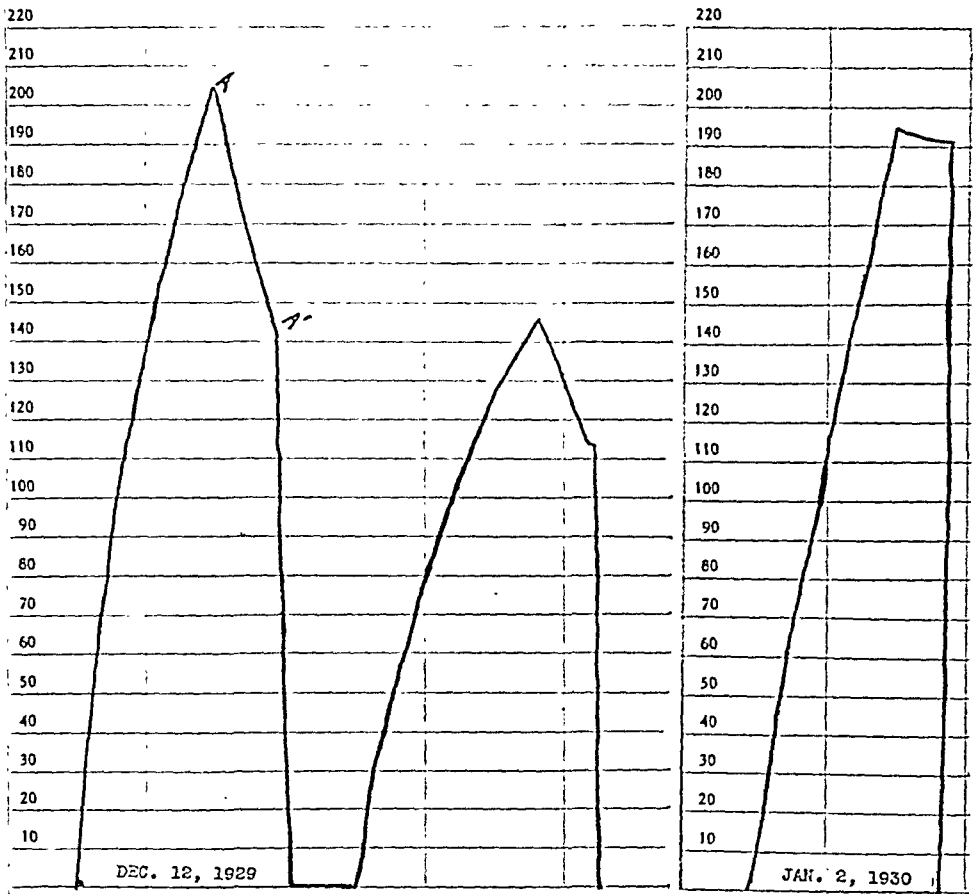


Fig. 14.—Insufflation—two attempts first sitting; in each instance slight drop due to regurgitation from cervix. Fluoroscopy negative.

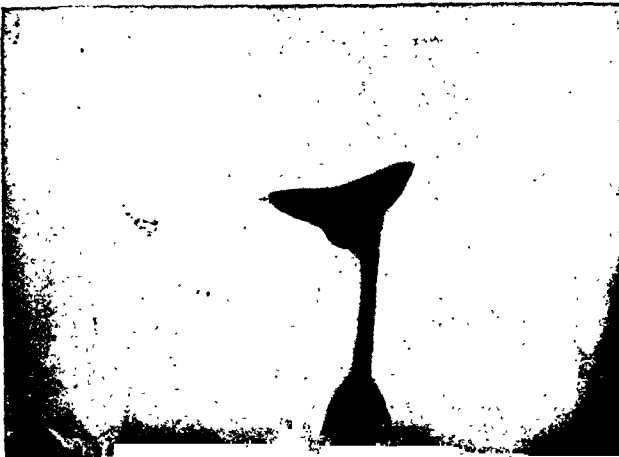


Fig. 15.—Lipiodol shows isthmus of right tube outlined at a distance of three-fourths of an inch where it ended rather abruptly.

Midline pain referable to the uterine distention is the rule. For practical purposes it is the same whether the intramural portion or the proximal isthmic portion of the tube is blocked. As in each case if an operation is done, it would necessarily be an isthmic resection and ampullary implantation in the uterine cavity.

PROGNOSTIC VALUE OF THE CURVE WITH REFERENCE TO TUBAL STRICTURE

When normal peristalsis is exhibited by the tubes during insufflation and the initial pressure is below 100 mm. Hg, the prognosis as far as pregnancy is concerned is good, i.e., provided all other factors possibly entering into the cause of the sterility have been satisfactorily accounted for. When the pressure is high at the initial rise and the sharp drop is then followed by more or less normal peristalsis, it indicates the presence of spasm. This may be relieved by atropine or it may not require further treatment. The prognosis is good in such cases. But when the initial rise is high and the drop is gradual and there are no oscillations and especially if the character of this curve is not much altered in subsequent tests, the prognosis is poor. In a certain proportion of cases repeated insufflation appears to improve the status of the tubes as indicated by lower pressures and the exhibition of more typical peristaltic motions. The possibility of tubal pregnancy in such instances must be borne in mind.

In a number of instances where the test could be prolonged for more than a minute or two the possibility of a prompt therapeutic action was suggested by the improved kymographic curve which was obtained toward the end of the insufflation. Apparently some obstruction was thus overcome. Whether this be in the nature of a mild agglutination or due to circumscribed adhesions the tubes nevertheless appear to straighten out, for the pressure is reduced and there is a tendency to show oscillations characteristic of peristaltic motions.

The best proof of the therapeutic value of uterotubal insufflation in such cases is of course seen when pregnancy results. A relatively small number of patients have become pregnant in my series who have had varying degrees of obstruction. (In 27 out of 205 cases of pregnancy following peruterine insufflation, the initial pressure was 100 mm. Hg or more. In 12 of these the pressure reached 200 mm. Hg the first time and normal limits on a second insufflation.¹⁶)

In several of my cases patency was demonstrable by uterotubal insufflation after lipiodol injection failed to show any patency. The question naturally arises whether some therapeutic action can be ascribed to the lipiodol. These cases are few indeed and I should hesitate to answer this question in the affirmative until more experience has been gained in this connection; because in a very few cases with nonpatency (at pressures of 200 mm. Hg), the tubes may become patent after a lapse of time without having had recourse to lipiodol or any treatment whatever. It is a mistake therefore to give an ab-

solutely unfavorable prognosis even when lipiodol fails to demonstrate patency. For CO₂ uterotubal insufflation at least three tests are necessary to make an unfavorable prognosis; in this respect such insufflations can certainly be carried out more readily than lipiodol injections. I have seldom failed to get my patients to repeat the gas test three or more times when necessary. The same cannot be said for lipiodol. Some patients who would defer an operative procedure indefinitely do not mind repeated insufflation, realizing how insignificant they are compared to a laparotomy.

Inasmuch as we cannot yet promise enthusiastic results from laparotomy and tubal plastic operations, we are forced to yield to the request of some patients to persist in our efforts with CO₂ uterotubal insufflation and lipiodol injections.

In this connection it may be well to point out that the occasional report of pregnancy taking place after the tubes have been found to be nonpatent¹⁷ may be explained by the fact that only one test was carried out. Spasm may have accounted for the high pressure reached or the tubes may have been opened without giving frank evidence of patency. Although I have often hoped this might be the case in certain patients who ardently desired children I have never seen a pregnancy occur when three successive tests failed to show patency at 200 mm. Hg. The prognosis is obviously much better when a second insufflation is associated with lower pressure levels.

The strictures encountered in retroflexion and retroversion are noteworthy. By uterotubal insufflation one finds not infrequently an obstruction at the uterine ostiae, the intramural portion or the proximal portion of the isthmus of both tubes. Sometimes one can overcome the obstruction by increasing the pressure. There need be no adhesions at the exit of the tubes from the uterus nor need there be agglutinations of its lumen at that junction. Case A. W. is a beautiful example in point where both CO₂ uterotubal insufflation as well as lipiodol injection showed a distinct stenosis at or near the intramural portion. Laparotomy at Mt. Sinai Hospital Private Pavilion showed the uterus bound down posteriorly by dense adhesions to the sigmoid and the tubes were kinked at the isthmus just short of their exit from uterus. An insufflation done three weeks after the ventrosuspension showed a perfectly normal graph with typical peristalsis.

This finding in retroversion and retroflexion has been noted many times. Wherever it is possible to correct the position of the uterus, repeated insufflation can also determine the correction of the tubal kinks. When these are not straightened out by the reposition of the uterus, it is safe to conclude that there are adhesions surrounding the tubes near the uterine ostiae. Before deciding upon a laparotomy for the correction of the malposition, an insufflation should be done to decide the point of tubal patency. In instances where the tubes are

found to be freely patent in spite of the malposition of the uterus it is doubtful whether an operation for its correction would do any good as far as the sterility is concerned. In my opinion this should prove the determining point for or against laparotomy.

Another question that arises is whether one should subject the wife to a tubal insufflation when it is known definitely that her husband is sterile. There are occasional cases in which the woman desires to know whether she has not been rendered sterile through her husband or whether in considering a remarriage she should not first be certain of the possibility of conceiving. In such cases it is certainly justifiable to do a uterotubal insufflation. In a number of such marriages the wife has been found to have tubal obstructions and strictures which in themselves would act as deterrents to pregnancy.

The pain experienced by the patient in some cases of tubal stricture is not well tolerated. In a few cases I have been obliged to stop the test when 160 mm. Hg had been reached. It is not always a hypersensitive patient in whom this is noticed. The relatively high pressure indicates at once the presence of an obstruction and the pain radiation locates its nature and situation. It has been seldom necessary to resort to the administration of morphine to carry out a second insufflation in these intolerant patients. The vast majority support the test very readily. Atropine has been given as a preliminary measure in a few cases. The element of fear is sometimes troublesome in nervous patients. As CO₂ uterotubal insufflation requires less time than lipiodol injection and as it may be carried out in a light room, fear is less likely to occur. The pain reactions are perhaps for these reasons somewhat more exaggerated when lipiodol is used. The situation and radiation of pain responses due to tubal distention are practically the same in each case.

It may be that some other gas which may have radio opacity as well as increased resorbability will be available in the future and thus supplant CO₂. Meantime, CO₂ has proved almost ideal as it is nonirritating and is capable of very rapid resorption from the peritoneal cavity. With the small amount necessary to employ for the test the gas may disappear from beneath the diaphragm in a few minutes. By placing the patient in a semi-Trendelenburg posture on the examining table the discomfort felt in the shoulders due to referred pain sensations from the diaphragm is reduced materially. In the average case the patient need experience no more pain than a sense of discomfort in the shoulders for the brief space of time required for fluoroscopy. Fluoroscopy is best carried out the moment the insufflation is completed. Immediately afterward if a subphrenic meniscus of more than one-half inch in depth is produced the patient may be made comfortable by placing her upon the examining table with the head lower than the legs.

It is not my purpose to press the claims of superiority of this method over lipiodol injection. There can be no doubt that in certain well defined cases lipiodol has its uses. As a contrast medium in the pelvis CO₂ is certainly not to be compared with lipiodol in the slightest degree since even the uterine cavity cannot, except in rare instances, be visualized with gas and the tubes practically never.¹³ In the subphrenic space however the CO₂ gas renders exquisite contrast between the lungs and heart above and the liver, stomach, and spleen below the diaphragm.

Our chief concern must be in estimating the diagnostic and therapeutic service of each method as now employed for routine purposes and of both methods combined when necessary.

CONCLUSION

The method of uterotubal insufflation can determine the fact of tubal patency and of nonpatency. It can in the vast majority of the cases of nonpatent tubes render information as to the site of the obstruction at the uterine end or the fimbriated end and thus aid in a decision for or against operative intervention to open the tubes. With the help of abdominal auscultation and careful notation of the pelvic pain reaction during the examination it is often possible also to locate the tube which may be the seat of a permeable stricture. The diagnosis of bilateral permeable strictures is more difficult whether gas or iodized oil is used. With the aid of the kymograph certain alterations of tubal function such as uterotubal spasm and those due to peritubal adhesions are also readily diagnosticated.

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(For discussion, see page 127.)

RECONSTRUCTION OF THE CERVICAL LIGAMENTS FOLLOWING COMPLETE HYSTERECTOMY*

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WHEN I first undertook to do a complete hysterectomy it was difficult to find an easy method to close the vault of the vagina and utilize the whole support of the cervix. When I saw my cases in the follow-up, I found myself confronted with patients who had vaginal vaults consisting of a thin layer of tissue between the vagina and the abdomen, because the original supports had retracted, the real ligaments had been omitted in the closure and the vaginal vault began to fall down. Could this not be overcome? I believe so and in March, 1923 I accomplished the utilization of the complete support but using all of the ligaments to oppose each other, and thereby constructing a substantial diaphragm above the vagina. The operative time was also sufficiently short to warrant continuation of this procedure. Since that time I have used it consistently when the complete removal of the uterus has been indicated.

This report is made up of 110 consecutive cases, 10 being private cases done at the Booth Memorial Hospital with no deaths, 23 being private cases done at the Woman's Hospital with one death, 60 being ward cases done at the Woman's Hospital with one death and 17 being ward cases done at the Woman's Hospital by interns under my direction, with no death. This gives a mortality rate of 1.8 per cent.

The technic of the hysterectomy does not appear in this paper except in as much as is required to prepare the tissues for reconstruction of the cervical ligaments. The discussion of the relative merits of complete and supravaginal hysterectomy is also omitted.

While I have for seven years used this method of completely utilizing the cervical ligaments after complete hysterectomy, I claim no priority for the principle since several members of this Society may have performed the operation for some time, yet, the procedures thus far described differ only in that they either leave the ligaments undisturbed or only partially utilize them. In quite a number of instances, I have noted the relaxed and injured ligaments, the relaxed wall beneath the bladder, the relaxed uterosacral ligaments and the broad deep culdesac, each of which I am certain can be improved by a complete and deliberate use of the ligaments. Therefore I have proposed the following standard to be attained:

*Read at a meeting of the New York Obstetrical Society, February 11, 1930.

1. Complete utilization of every cervical support.
2. No shortening of the vagina but rather lengthening it.
3. Approximation of the muscle supports of the cervix so that they continue to actively oppose each other.
4. Strengthening the anterior wall and making an improved support for the bladder.
5. Reducing to a minimum the postoperative anastomosis of the vessels of the vaginal vault.
6. Reducing the size of the culdesac of Douglas and if so desired obliterating it to do away with an enterocele.

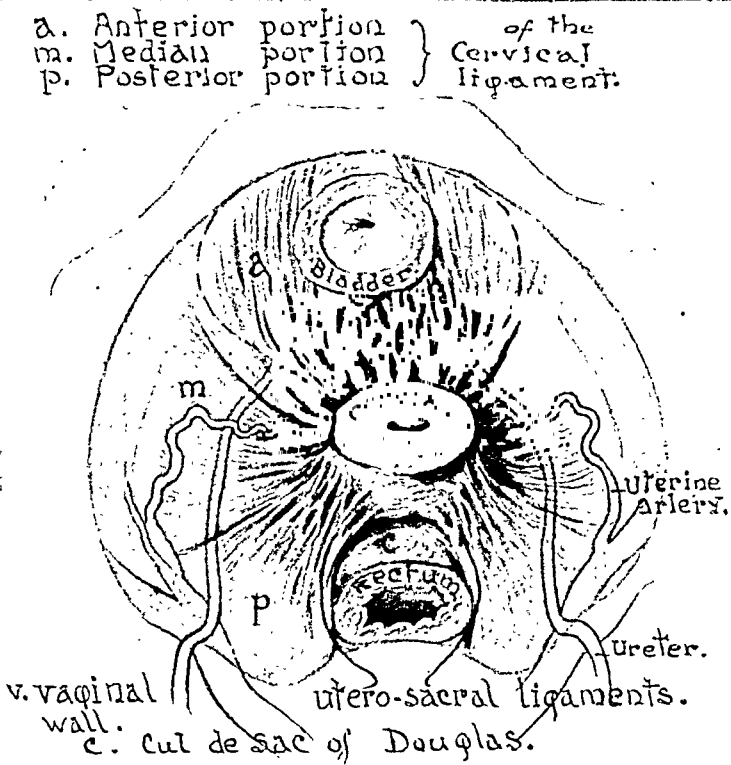


Fig. 1.

THE CERVICAL LIGAMENTS

One cannot describe the anterior vaginal wall and the cervical supports without linking the names of Sims, Emmett, J. Riddle Goffe, Tweedy, Hadra, Martin, Frank, Ward, Rawls, Farrar, Dickinson, Bissell, Kelly, Noble, Watkins, Mayo, Polk, Halban and Tandler, Byron H. Goff and Nyulasy.

Nyulasy¹ studied the uterine support both in the fetus and the adult and came to the conclusion that the support of the uterus was derived from the pelvic wall. Byron H. Goff² writing recently, explains clearly that the cervical ligament fibers are all derived from the fascia endopelvina which lies in contact with the muscle fasciae but is separate and distinct from these fasciae, being joined to them by connective tissue only. The fascia endopelvina gives off from its pelvic wall por-

tion, a network of connective tissue to fasten itself into and about the musculature of the cervix. The external part, lying between the pelvic wall and the course of the ureter contains no muscular tissue while the internal part lying between the course of the ureters and the cervix is filled with smooth muscle tissue, budded out from the cervix. The ureters, therefore, from their position are protected during parturition. The network of the fibers of the support are absent only anterior to the urethra and posterior to the rectum.

Both Martin and Nyulasy, have divided the supports into the anterior, median and posterior portions.

The posterior ligament fibers are more numerous and more concentrated, forming the uterosacral ligaments.

The bladder lies upon the two anterior portions and the base of the bladder is kept taut by two fibromuscular (Nyulasy) bands connected into the cervix on either side. *It is important in all operative procedures either not to disturb these bands (again derived from the fascia*

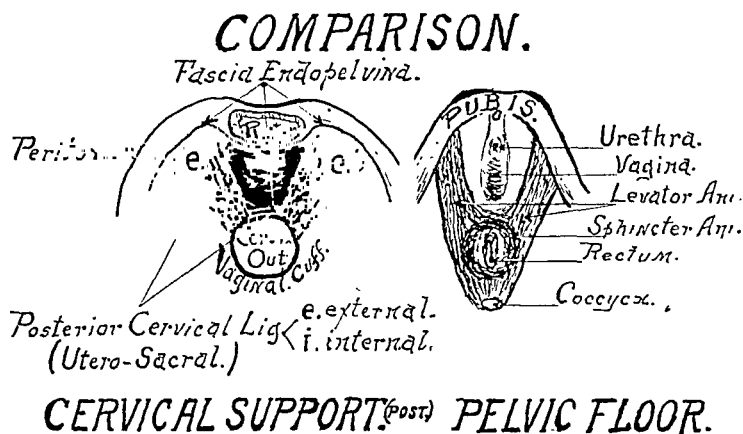


Fig. 2.

pelvina) or to restore them to their original positions since the floor of the bladder depends upon them for support.

Fig. 1 illustrates the cervical ligament, its anterior, median, and posterior portions, and the relation of the ureters, uterine artery, and the bladder to this structure. The muscle from the cervix which digitates with the connective tissue of the ligament, out about as far as the course of the ureter, is not inserted in Fig. 1.

PREVIOUS OPERATIVE PROCEDURES

A number of simple methods of removing the cervix with the uterus has been described but in the closure of the vaginal opening the cervical ligaments have not been utilized to satisfy the standard set up by me.

Worrall³ describes a technic by which the cervix is shelled out of its supporting collar and the closure is effected by four figure-of-eight sutures. No correction can be made in attenuated or relaxed ligaments and the supports are unchanged by operation.

Polak⁴ in his excellent article states that "Furthermore in this technic we have taken care to preserve the uterosacral ligaments, and they are also attached to and sutured into the vaginal vault, thus maintaining its high position in the pelvis."

Nyulasy¹ after cutting away the uterus states that "The stumps on each side are secured by a continuous ligature, the free ends being used to close the rectovesical gap." No illustration is given.

Lahey⁵ presents a similar method to Worrall's of utilizing the cervical ligaments. Richardson's⁶ method has some similarity to Polak's.

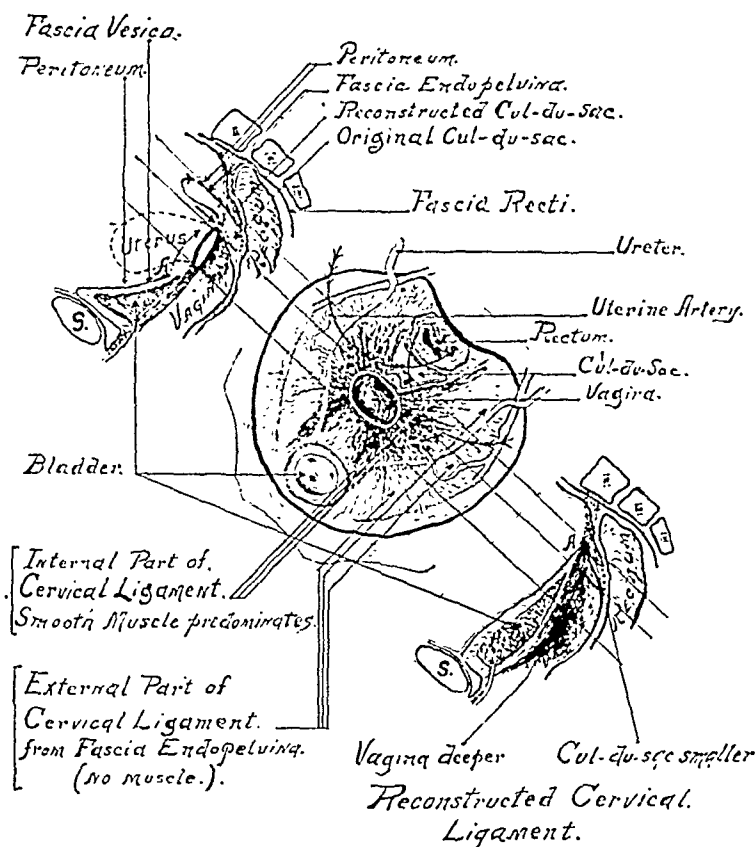


Fig. 3.

OPERATIVE EXPLANATION

In Fig. 2 I have endeavored to compare the relation of the uterosacral ligaments and the cervix with the relation of the levator ani muscles and the rectum. Should the levator ani muscles become injured or attenuated in a laceration of the pelvic floor, an operative procedure would immediately be indicated and done. When an injury or relaxation of the uterosacral ligaments takes place, it should also be corrected and can be corrected after the cervix has been removed.

In Fig. 3 the upper illustration shows transversely the relative position of the bladder, the cervical supports, the fascia of the culdesac (fascia endopelvinæ), the vagina, and the rectum. The anterior por-

tion of the fascia of the culdesac is loosely attached to the vaginal wall of the posterior fornix and loosely attached to the rectum. It can, therefore, be separated and lifted up to obliterate the culdesac.

The center illustration is a vertical view of the plane at right angles to the upper illustration. The uterosacral ligaments can be ligated at



Fig. 4.—*a*, Round ligaments. *b*, Fallopian tubes. *c*, Clamps on uterosacral ligaments. *d*, Culdesac.

any point desired, cut away and swung on the arch of the circle indicated and fastened to its corresponding ligament in the midline, thus reducing materially the entrance to the culdesac. The fascia endopelvina of the culdesac (at any point desired), the fascia vesica and peritoneum of the bladder and the posterior point of the vaginal cuff

are attached to the point of union of the uterosacral ligaments. The transverse or median portions of the ligament are then approximated end to end as are the free ends of the anterior portions. The fascia vesica and fascia endopelvina of the culdesac are now continuous and the vaginal vault is made up entirely of cervical supports, so that the diaphragm between the abdominal cavity and the vagina becomes com-

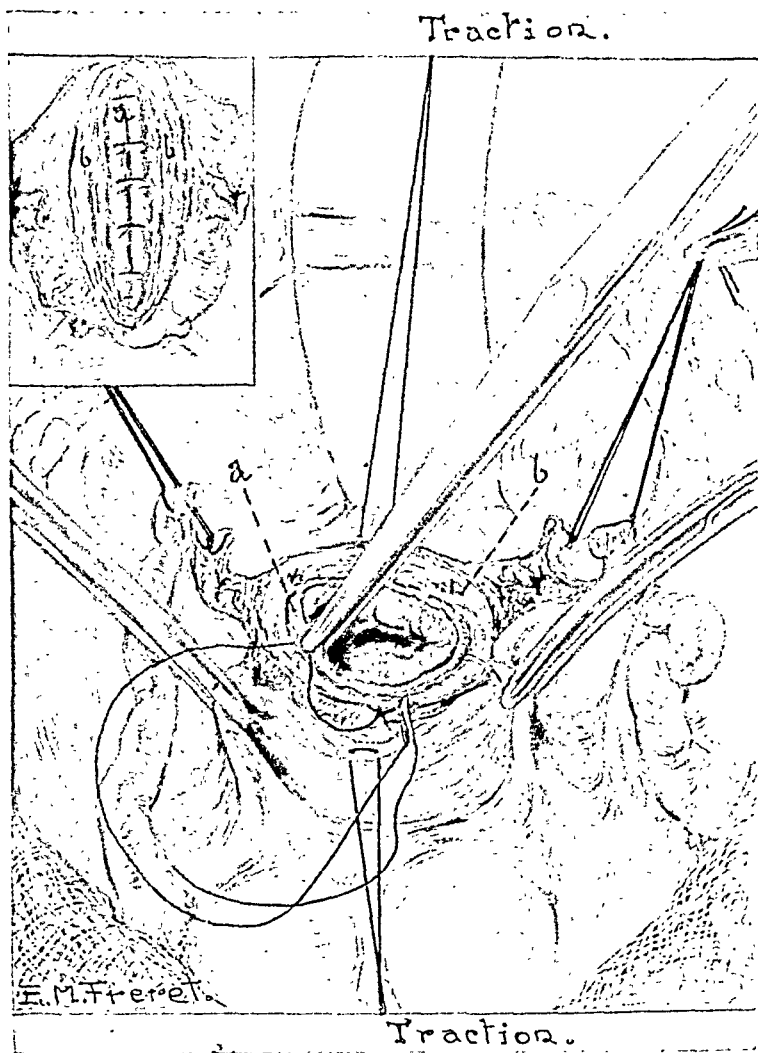


Fig. 5.—*a*, Vaginal mucosa. *b*, Anterior vaginal tissue, contains cervical ligaments.

plete except the space where the rectum passes, and the small culdesac lies anterior to it. The vagina is now deeper and the bladder has a support equal to or perhaps more substantial than its original. Since the cervix has been removed all infected areas are absent from this diaphragm. The culdesac is narrower and shallower while the vagina is deeper. Theoretically it is so done, but can it be accomplished simply and expeditiously? (See Fig. 4.)

OPERATIVE PROCEDURE

All the blood supply is ligated without clamping (except the return flow through the fundus), and the pedicles distal to the ligatures are left long. Traction sutures are put in the vaginal wall anterior and posterior to the cervix. The vagina is entered posterior to the cervix and the vaginal wall is cut close to the cervix. The uterosacral ligaments are ligated as far as one desires from the cervix consistent with the shaping of the culdesac and the complete portion of the ligament (not the edge) included in the ligature. The first suture of No. 2 chromic catgut includes the peritoneum, and fascia of the culdesac and

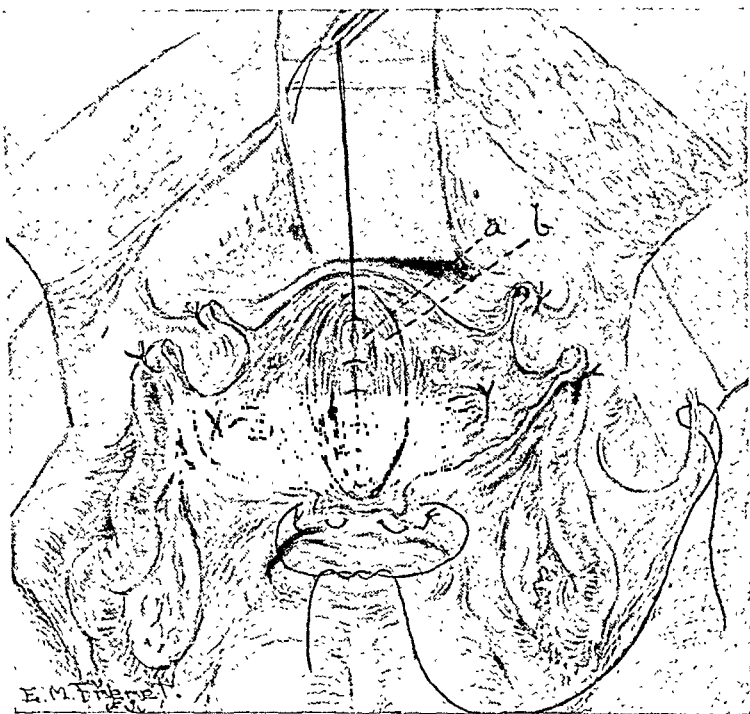


Fig. 6.—*a*, Vaginal mucosa. *b*, Anterior vaginal tissue, contains cervical ligaments.

the vaginal cuff all in the midline posteriorly. This ligature is tied and one end is continued as a submucous mattress suture toward the bladder thus everting the vaginal cuff into the vagina. It is then tied. The second No. 2 chromic catgut suture includes in order, the distal end of the uterosacral ligament near its ligature, the fascia of the culdesac, the vaginal cuff (or the beginning of the first suture), the fascia of the culdesac, and the end of the other uterosacral ligament. This ligature is tied fixing the posterior point of the vagina. One end is carried forward as a mattress suture, bringing together in the midline the fasciomuscular ends of the cervical ligament (a very definite structure when seen at operation). It is tied at the end of the closure. A figure-of-eight suture is passed through the midline and through the ends of

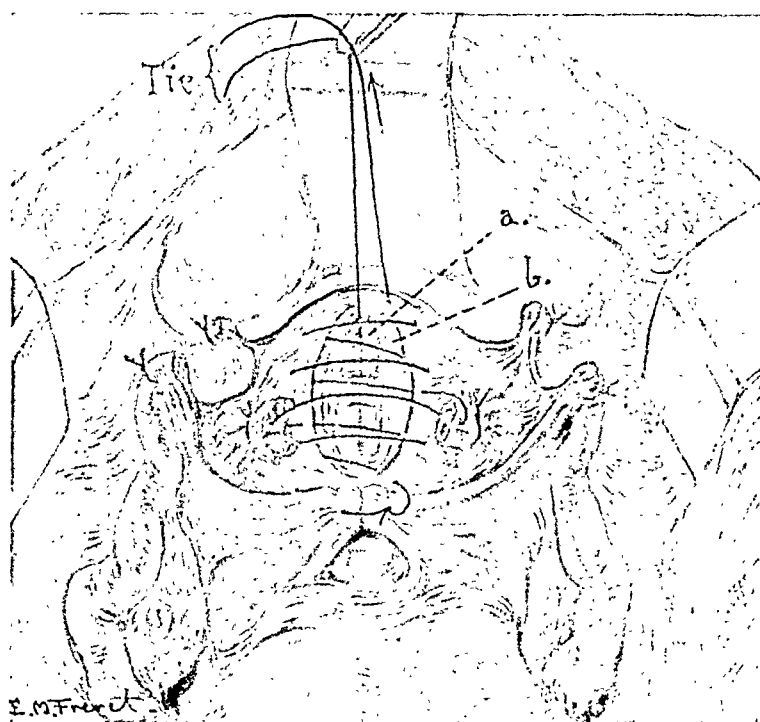


Fig. 7.—a, Vaginal mucosa. b, Anterior vaginal tissue.

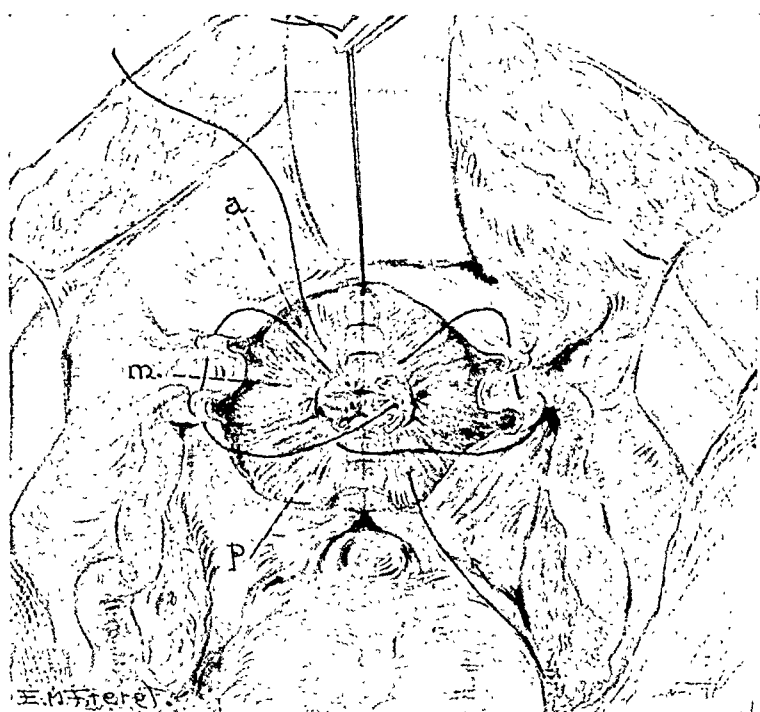


Fig. 8.—a, Anterior portion, m, median portion, p, posterior portion of the cervical ligament.

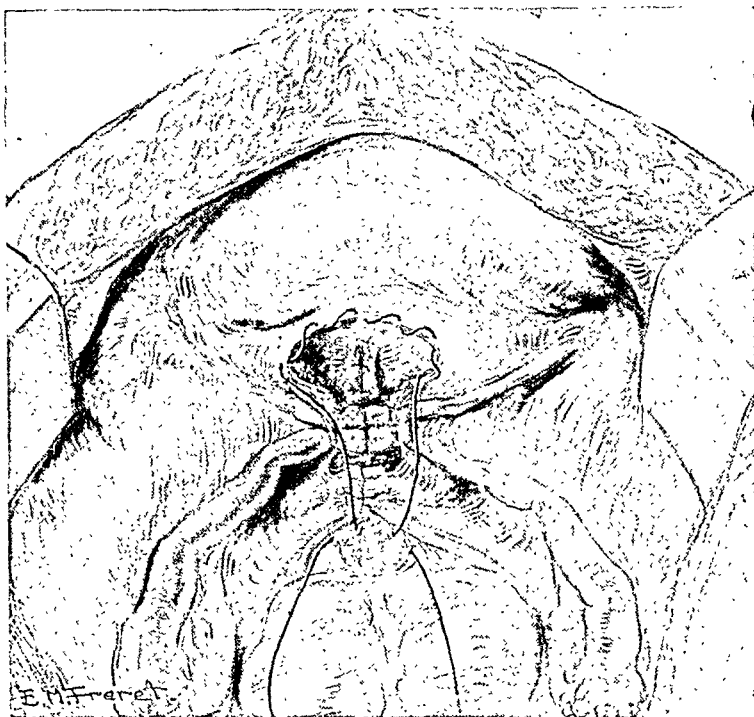


Fig. 9.

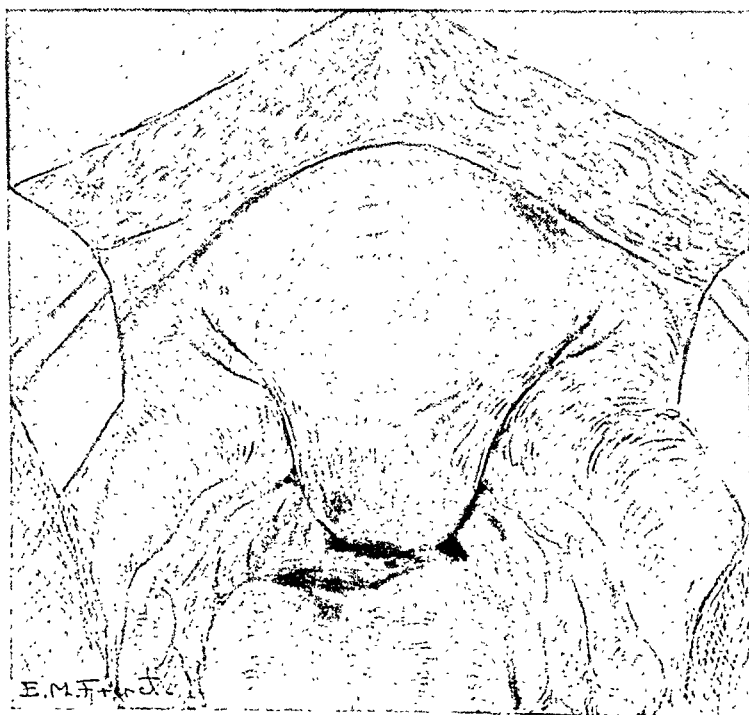


Fig. 10.

the round ligaments and tubes, is drawn tight and tied. This is done as an easy method of peritonealizing the raw surfaces. A suture is begun in the culdesac and passed through the fascia vesica as illustrated and tied in the culdesac to complete peritonealization. The abdomen is closed by the layer method.

THE RESULTS

Operations.—In order that a systematic analysis be made it was decided to serially study the patients according to their operation, and a chart was so arranged. The serial numbers appearing at the left of each chart is followed through in the successive charts, e.g., serial No. 3, each patient had a complete hysterectomy and an appendectomy, etc. Table I is self-explanatory.

TABLE I

| | NO. OF CASES |
|---|-----------------|
| Hysterectomy, complete and | |
| 1. No other procedure | 2 |
| 2. No other procedure (appendix previously removed) | 2 |
| 3. Appendectomy | 21 |
| 4. Appendectomy, adhesions | 8 |
| 5. Adhesions | 1 |
| 6. Adhesions (appendix out) | 1 |
| 7. Unilateral salpingo-oophorectomy | 2 |
| 8. Unilateral salpingo-oophorectomy and appendectomy | 8 |
| 9. Unilateral salpingo-oophorectomy and adhesions | 2 |
| 10. Unilateral salpingo-oophorectomy, appendectomy and adhesions | 5 |
| 11. Bilateral salpingectomy, unilateral oophorectomy and resection of ovary | 1 |
| 12. Bilateral salpingectomy, unilateral oophorectomy and appendectomy | 2 |
| 13. Bilateral salpingectomy, unilateral oophorectomy and appendec- tomy, adhesions | 1 |
| 14. Bilateral salpingo-oophorectomy | 4 |
| 15. Bilateral salpingo-oophorectomy and appendectomy | 18 |
| 16. Bilateral salpingo-oophorectomy, appendectomy and adhesions | 14 |
| 17. Bilateral salpingo-oophorectomy and adhesions | 4 |
| 18. Bilateral salpingo-oophorectomy and adhesions (appendix out) | 1 |
| Portion of tubes and ovaries removed at previous operation (below) | |
| 19. Tubo-ovarian tissue now all removed (appendix removed previously) | 5 |
| 20. Tubo-ovarian tissue now all removed and adhesions | 4 |
| 21. Tubo-ovarian tissue now all removed and appendectomy | 1 |
| 22. Tubo-ovarian tissue now all removed, appendectomy, and adhesions | 1 |
| 23. Tubo-ovarian tissue now all removed, appendectomy, and adhesions right ovary left | 1 |
| 24. Tubo-ovarian tissue now all removed, appendectomy, adhesions, left tube and ovary left | 1 |

POSTOPERATIVE OBSERVATIONS (IN HOSPITAL)

For operation 104 patients had an induction anesthesia of nitrous oxide and oxygen followed by ether, 2 had a spinal anesthesia augmented by ether and 4 had spinal anesthesia only.

Morbidity.—By averaging the total number of postoperative days when the temperature was greater than 102° F., each patient was found

to have such a temperature for 0.78 days and by averaging the total number of postoperative days when the temperature was greater than 100° each patient was found to have such a temperature for five and one-half days.

Wound Healing.—Of the 110 cases, 99 had primary union (Class A), 9 had primary union except slight minor defect (Class B), while 2 had a major infection with granulation (Class C).

Complications.—These are shown in Table II. It will be observed that one death occurred as the result of tetanus and peritonitis while the other death was due to peritonitis.

Pneumonia occurred twice, one in whom the appendix was removed at operation and the other in whom the appendix was not disturbed.

Infarct occurred once and thrombophlebitis once, in patients from whom the appendix was removed.

Blood in the urine occurred once in a patient who had a long operation for removal of a bicornuate uterus with myoma.

Cystitis appeared twice, pyelitis five times and colitis once.

TABLE II. COMPLICATIONS

| SERIAL NO. | NO. OF CASES | THROMBO-PHLEBITIS | CYSTITIS | PYELITIS | COLITIS | PNEUMONIA | INFARCT | WOUND MAJOR INFECTION | BLOOD IN URINE | TETANUS | PERITONITIS |
|------------|--------------|-------------------|----------|----------|---------|-----------|---------|-----------------------|----------------|---------|-------------|
| 1 | 2 c | | | | | | | | | | |
| 2 | 2 a | | | | | | | | | | |
| 3 | 21* | | | 2 | | 1 | | 1 | | | |
| 4 | 8* | | | 1 | | | | | | | |
| 5 | 1 c | | | | | | | | | | |
| 6 | 1 a | | | | | | | | | | |
| 7 | 2 c | | | | | | | | | | |
| 8 | 8* | | | | | | | | | | |
| 9 | 2 c | | | | | | | | | | |
| 10 | 5* | | | | | | | | | | |
| 11 | 1 c | | | | | | | | | | |
| 12 | 2* | | | | | | | | | | |
| 13 | 1* | | | | | | | | | | |
| 14 | 4 c | | | | | 1 | | | 1 | | |
| 15 | 18* | | 1 | 1 | 1 | | 1 | | | 1 | |
| 16 | 14* | 1 | | 1 | | | | 1 | | Death | |
| 17 | 4 c | | | | | | | | | | 1 |
| 18 | 1 a | | | | | | | | | | Death |
| 19 | 5 a | | 1 | | | | | | | | |
| 20 | 4 c | | | | | | | | | | |
| 21 | 1* | | | | | | | | | | |
| 22 | 1* | | | | | | | | | | |
| 23 | 1 c | | | | | | | | | | |
| 24 | 1 c | | | | | | | | | | |
| Total | 100 | 1 | 2 | 5 | 1 | 2 | 1 | 2 | 1 | 1 | 2 |

*Appendectomy in 79 Cases.

a Appendectomy previously in 9 Cases.

c Appendix remains in 22 Cases.

TABLE III. PATHOLOGY

| SERIAL NO. | NO. OF CASES | MYOMA | POLYP | CARCINOMA OF FUNDUS | FIBROSIS | ADENOMYOSIS | CERVICITIS | ENDO-METRITIS | SALPINGITIS | CHRONIC APPENDICITIS | ADHESIONS | OVARIAN CYSTS | PREGNANCY | HYPERPLASIA ENDO-METRIUM |
|------------|--------------|-------|-------|---------------------|----------|-------------|------------|---------------|-------------|----------------------|-----------|---------------|-----------|--------------------------|
| 1 | 2 | 1 | | 2 | 1 | | 1 | 1 | | | | | | |
| 2 | 2 | 2 | | 1 | 5 | 1 | 3 | 1 | 1 | 2 | | 1 | 1 | 1 |
| 3 | 21* | 16 | 4 | | 1 | | 2 | | | 2 | | | 1 | |
| 4 | 8* | 4 | 1 | | | | | | | | | | | |
| 5 | 1 | 1 | | | | | | | | | | | | |
| 6 | 1 | | | | | 1 | | | | | 1 | | | |
| 7 | 2 | 1 | | 1 | | | | | 1 | 1 | | 4 | | |
| 8 | 8* | 8 | | 1 | | | 3 | | 1 | 2 | | 1 | | |
| 9 | 2 | 7 | | 1 | | | 1 | | 1 | | | | | |
| 10 | 5* | 5 | | | | | | | 1 | | | | | |
| 11 | 1 | 1 | | | | | | | 1 | | | | | |
| 12 | 2* | 1 | | | | | 1 | | 1 | | | | | |
| 13 | 1* | 1 | | | | | | | 1 | | | | | |
| 14 | 4 | 3 | | | 1 | | | | 1 | | | 1 | | |
| 15 | 18* | 11 | | | 1 | | 1 | 1 | 3 | 4 | 1 | 6 | | 1 |
| 16 | 14* | 13 | 1 | | 1 | | 3 | | 6 | 1 | 1 | 5 | | |
| 17 | 4 | 3 | 1 | | | | 2 | | 2 | 1 | | | | |
| 18 | 1 | | | | | | 1 | | 1 | 1 | | 2 | 1 | |
| 19 | 5 | 1 | | | 2 | | | 1 TB | | | | 1 | | |
| 20 | 4 | 4 | | | | | | | | | | | | |
| 21 | 1* | | | | | | 1 | | | | | | | |
| 22 | 1* | | | | | | | | 1 | | | 1 | | |
| 23 | 1 | 1 | | | | | 1 | | | | | 1 | | |
| 24 | 1 | 1 | | | 1 | | | | | | | 1 | | |
| Total | 110 | 79 | 6 | 5 | 13 | 8 | 19 | 4 | 23 | 13 | 3 | 23 | 4 | 2 |

*Appendectomy in 79 cases.

PATHOLOGY

The pathology chart (Table III) is self-explanatory excepting that the indications for removing both the cervix and the uterus do not wholly appear herein. Adenomyosis occurred in 8 cases and fibrosis in 13 cases, all of which it were well the uterus was removed. Pregnancy occurred 4 times in complication with myoma. Endometritis occurred 4 times, once in a patient having tuberculosis who had had her tubes and ovaries removed at a previous operation. They were also tuberculous. Cervicitis occurred in 19 cases and was associated with bleeding in some of them and with myoma in others. Persistent vaginal discharge was not the sequence of any postoperative cervicitis and any discharge which came from the cervix before operation disappeared following its removal.

FOLLOW-UP

The total number of cases operated upon was 110, and 13 of these never returned, leaving 97 to analyze. Of this number 80 were satisfactory, 2 were failures, 3 partially satisfactory, 1 died of carcinoma of the kidney two years later, 5 had carcinoma of the fundus, and 1 had sarcoma of the fundus. Five are still being treated for some condition developed since leaving the hospital.

In two cases the vaginae were shortened, their depths being about 5 cm. and one had a constriction develop after operation which later entirely passed away but left the patient with a persistent vaginitis. Two have been classified as complete failures. One because she developed a tubovaginal sinus which intermittently emptied a discharge into the vagina. On repeated examination this sinus was never found. I lost track of this patient. The second was a patient who had two vaginal operations for prolapse, both of which had failed and I found a soft mass filling the culdesac which I believed to be a cyst, and as she had appendicitis symptoms, an abdominal operation was done. The mass proved to be perirectal fat and could not be removed and scarcely any ligaments could be found although what were there were utilized, but the result was a failure. A pessary kept this patient comfortable and a secondary pelvic floor was contemplated but never done. Five carcinomas and one sarcoma are being followed with no evidence of any recurrence but it is rather early for metastases. Three are partially satisfactory, one having intermittent left pelvic pain, one having persistent vaginitis, and one having a reinfected urethra and vaginal mucosa after leaving the hospital. One private case had an operation for carcinoma of the kidney one and one-half years after this operation and died six months later. Seventy-nine were in excellent health and had either no complaint or only very minor ones. Vaginal discharge occurred in seven patients. Four of these were incisional dis-

TABLE IV. FOLLOW-UP

| SERIAL NO. | NO. OF CASES | EXCEL- LENT HEALTH | VAGINAL ABNOR- MALITY | VAGINAL DIS- CHARGE | FRE- QUENCY | PYEL- ITIS | COLITIS G. I. | AD- NEXAL AREA | OVARIAN CYSTS | ORTHO- PEDIC | KELOID | RECUR- RENCE OF CAR- CINOMA | CAR- CINOMA OF KIDNEY | MEMO- PAUSE | FAIL- URE | PARTIAL SATIS- FACTORY | SATIS- FACTORY |
|------------|--------------|--------------------|-----------------------|---------------------|-------------|------------|---------------|----------------|---------------|--------------|--------|-----------------------------|-----------------------|-------------|-----------|------------------------|----------------|
| 1 | 2 | 1 | | | | | | | | | | | | | | | 1 |
| 2 | 2 | 2 | | | | | | | | | | | | | | | 2 |
| 3 | 21* | 15 | 1 | 1 | | | 2 | | 2 | 1 | 1 | (2) 0 | | | 1 | 1 | 16 |
| 4 | 8* | 8 | | | | | | | 1 | | | | | | | | 6 |
| 5 | 1 | 1 | | | | | | | | | | | | | | | 1 |
| 6 | 1 | 1 | | | | | | | | | | | | | | | 1 |
| 7 | 2 | 2 | | | | | | | 1 | | | | | | | | 1 |
| 8 | 8* | 7 | | | | | | | | | | (1) ? | | 1 | | | 7 |
| 9 | 2 | 2 | 1 | | | | | | | | | | | 1 | | | 1 |
| 10 | 5* | 3 | | | | | | | | | | | | | | | 4 |
| 11 | 1 | ? | | | | | | | | | | | | | | | 0 |
| 12 | 2* | 2 | | | | | | | | | | | | | | | 2 |
| 13 | 1* | 1 | | | | | | | | | | | | | | | 1 |
| 14 | 4 | 3 | 1 | 1 | 1 | | | | | | | | | | | | 1 |
| 15 | 18* | 10? | 1 | 1 | 2 | | 1 | | 1 | 1 | | (2) 0 | | 2 | 1 | 1 | 14 |
| 16 | 14* | 10? | 1 | 1 | 1 | | 1 | | | | | (1) ? | 1 | 4 | | | 11 |
| 17 | 4 | 2 | | | 1 | | | | | | | | | 1 | | | 2 |
| 18 | 1 | 1 | | | 1 | | | | | | | | | | | | 0 |
| 19 | 5 | 3 | | 1 | 1 | | | 1 | 1 | | | | | | | 1 | 3 |
| 20 | 4 | 1 | | | | | | | | | | | | | | | 1 |
| 21 | 1* | 1 | | | | | | | | | | | | | | | 1 |
| 22 | 1* | 1 | | 1 | | | | 1 | | | | | | 1 | | | 1 |
| 23 | 1 | 1 | | | | | | | | | | | | | | | 1 |
| 24 | 1 | 1 | | | | | | | | | | | | | | | 1 |
| Total | 110 | 79 | 4 | 7 | 5 | 2 | 4 | 2 | 6 | 5 | 2 | | 1 | 12 | 2 | 3 | 80 |

*Appendectomy in 79 cases.

charge which cleared up with one application of 10 per cent silver nitrate, but the other three had persistent discharges and were classified as partially satisfactory. Frequency of urination occurred in five cases, one appearing fifteen months after operation which responded to treatment in the Urological Department. Three other patients were soon relieved but the one who had a reinfection of the vagina also had a trigonitis and a urethritis which did not respond to treatment. Pyelitis and colitis were temporary and no case was persistent. Two patients who had had their ovaries removed were stated to have an ovarian cyst, but whatever this was, it was only transient. Only one had an ovarian cyst about 4 cm. in diameter which remained but gave no symptoms. Three had ovarian cysts which lasted from six to twelve months with only slight symptoms, and two patients who had had complete hysterectomy had pain in the adnexal areas for several months after operation. Five patients had orthopedic conditions which were either relieved or much improved after treatment. Two had stubborn keloids with some pain. Thirty-five patients retained both their ovaries and no menopause symptoms were noted. Sixty-two patients had one ovary or part of one ovary left after operation and of these, ten had menopause symptoms of varying degrees, most of which responded to Varium given by mouth thus relieving their symptoms. Thirteen patients had no ovarian tissue left and of these, two only had symptoms noted.

THE VAGINAL VAULT

It has been interesting to note that in making the follow-up examination that the vaginal vault in the majority of cases has a firmness which was absent in all cases done by the author before making use of the ligaments as this paper describes. One surgeon in examining one of these cases makes a note that the cervix was normal. It is noted also that the vaginal walls more nearly retain their normal position and do not give one the impression that they are falling in from the sides.

CONCLUSIONS

1. That the procedure is logical and simple and adds little to the length of time of complete hysterectomy.
2. That the closure affords a simple method of making the culdesac small in area, shallow in depth, and obliterating it if so desired to cure enterocele.
3. That the ligaments now all oppose each other and the support is as near a maximum as one might expect to attain.
4. That in quite a number of cases the newly constructed support is better than that which remains after a supravaginal hysterectomy where the ligaments have not been disturbed.

5. The undisturbed ligaments may have been attenuated or injured during parturition and should be reconstructed if so found necessary.

6. The procedure is not applicable to prolapse.

FINAL

I wish to take this opportunity to thank Dr. George Gray Ward, Chief Surgeon of the Woman's Hospital, for the interest taken in my efforts and for the use of the records of the hospital; Dr. N. Gilbert Seymour, Medical Director of the Booth Memorial Hospital, for the use of the records of that hospital and a follow-up report on several private patients; and Dr. Reginald M. Rawls, for the kindness in extending to me the privileges of commencing this study while associated with him as his Junior.

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(For discussion, see page 115.)

163 EAST SIXTY-FIRST STREET.

THE OCCURRENCE OF CANCER IN THE UTERINE CERVICAL STUMP AFTER SUPRAVAGINAL HYSTERECTOMY

BY LOUISE BRANSCOMB, M.D., BIRMINGHAM, ALA.

(From the Howard A. Kelly Hospital)

THE earliest reference in the literature to the occurrence of cancer in the cervical stump is that of Chrobak. Some twenty years later, 1906, Currier observed a case and collected 10 others from the literature. Numerous reports have occurred in the American and European literature of recent years. Among the most important contributions are those of Fleischmann (1925) 50 cases; Sanders (1924) 102 cases; Jeaneney and Chavannaz (1926) 85 cases; and Polak (1921) 256 cases. Polak collected entirely from the American literature. These reports not only cover the question of the occurrence of the disease, but also offer stimulating discussions and suggestions as to methods of preventing the development of cancer in the stump.

The author, during a period of two weeks, observed 6 such cases in the service of the Howard A. Kelly Hospital and found, on reviewing a series of 1804 cases of cervical carcinoma, that 46 belonged to this category.

When the time of development of the cancer after the supravaginal operation is taken into account the 46 cases fall into two groups, 16

occurred within one year and 30 after two years from the time of operation; the longest period was nineteen years and the shortest a few weeks. It is reasonable to believe that in the cases occurring within a year there might have been trouble already developed at the time of the supravaginal hysterectomy. Table I shows the condition for which the operation was done, the time elapsing before the appearance of the cervix cancer, and the microscopic structure of the cancer.

TABLE I

| NO. | SUPRAVAGINAL HYSTERECTOMY FOR | INTERVAL BEFORE APPEARANCE OF SYMPTOMS | TYPE OF GROWTH |
|-------|----------------------------------|---|-------------------------|
| 21749 | Nonmalignant condition | 19 yr. | Carcinoma |
| 17641 | Myomata uteri | 15 " | Squamous cell carcinoma |
| 20699 | Pelvic inflammatory disease | 14 " | " " " |
| 9221 | " " " "Tumors on uterus" | 13 " | " " " |
| 1309 | Myomata uteri | 12 " | Adenocarcinoma |
| 19448 | Injury due to auto accident | 10 " | Carcinoma, mixed type |
| 21429 | Myomata uteri | 10 " | Squamous cell carcinoma |
| 17726 | " " | 9 " | " " " |
| 10046 | " " | 9 " | Carcinoma |
| 14092 | " " | 8 " | Squamous cell carcinoma |
| 21782 | Pelvic inflammatory disease | 7 " | " " " |
| 18384 | Retroversion and prolapsus | 7 " | Carcinoma |
| 2629 | Pelvic inflammatory disease | 7 " | Squamous cell carcinoma |
| 17478 | Myomata uteri | 6 " | Adenocarcinoma |
| 19647 | " " | 5 " | Squamous cell carcinoma |
| 6371 | " " | 5 " | Carcinoma |
| 15906 | " " | 5 " | Squamous cell carcinoma |
| 3380 | " " | 5 " | Sarcoma |
| 2433 | " " | 5 " | Carcinoma |
| 19214 | " " | 4 " | Squamous cell carcinoma |
| 12634 | Pelvic inflammatory disease | 4 " | " " " |
| 4960 | Myomata uteri | 3½ " | Carcinoma |
| 17133 | " " | 3 " | Squamous cell carcinoma |
| 2911 | " " | 3 " | Carcinoma |
| 10552 | " " | 3 " | Adenocarcinoma |
| 19039 | " " | 3 " | Squamous cell carcinoma |
| 21491 | Pelvic inflammatory disease | 2½ " | " " " |
| 19668 | " " " | 2 " | " " " |
| 6105 | Myomata uteri | 2 " | Adenocarcinoma |
| 2629 | Pelvic inflammatory disease | 2 " | No report |
| 21701 | Myomata uteri | 1 " | Squamous cell carcinoma |
| 20213 | " " | 1 " | Adenocarcinoma |
| 19431 | Nonmalignant condition | 1 " | Squamous cell carcinoma |
| 2835 | Myomata uteri | 1 " | Carcinoma |
| 14684 | Myomata uteri | 7 mo. | No report |
| 20167 | Myomata uteri | 7 " | Squamous cell carcinoma |
| 21810 | " " | 6 " | Carcinoma |
| 16277 | " " | 3-4 " | Adenocarcinoma |
| 5466 | " " | 3-4 " | Squamous cell carcinoma |
| 12677 | " " | 2 " | Carcinoma |
| 18322 | " " | 2 " | " |
| 6519 | " " | 2 " | Squamous cell carcinoma |
| 4864 | Nonmalignant condition | 5 weeks | " " " |
| 20828 | Pelvic inflammatory disease | None | Epithelioma, basal cell |
| 13555 | Myomata uteri | " | Adenocarcinoma |
| 7959 | Myomata uteri, Chr. P.I.D. | " | Squamous cell carcinoma |

Among the 30 occurring after two years there is nothing in our records to show a predisposing cause to cancer in the stump except perhaps in instances No. 10522 and No. 6105 which were adenocarcinomas and might have been extensions from adenocarcinomas of the fundus uteri. The average age of the patients under study was forty-nine and three-tenths years, the oldest being sixty-nine and the youngest thirty-four. These figures represent about the average for occurrence of cancers of the cervix.

In all instances the operation had been done for nonmalignant conditions; 33 for myomas, 8 for pelvic inflammatory disease, 1 for prolapse, 3 for causes not ascertainable, and 1 on account of an automobile injury.

It is unlikely that the presence of fibroids of the uterus has any connection with the development of cancer in the cervix, although there is a current impression that the fibroid uterus is more frequently associated with cancer of the cervix than the nonfibroid uterus. In the presence of fibroids and bleeding, the gynecologist is too likely to jump to the conclusion that the fibroids are the cause of the trouble and a cancer is easily overlooked in an early stage. That this is borne out by the cases under consideration is shown by the fact that in the group which occurred in less than a year after the operation, 92 per cent were in association with fibroids, and in the later recurrences only 69 per cent show such an association. Leonard's observations correspond closely to those noted here.

In the total group of 46 there is a record of microscopic examination in all but 2. In 11 of these, in which the diagnosis was reported, of which slides are not now available, there is a diagnosis of carcinoma without statement as to type. In the remaining 33, 24 are squamous, 7 adenocarcinoma, 1 sarcoma, and 1 mixed cell carcinoma.

Thirty-seven of these patients had borne children and might have had trauma of some kind. Nine, married from thirteen to thirty years, had not had children, nor operations on the cervix. The importance of trauma as a cause of these cancers is not established by the cases under consideration.

Most cancers occurring in the cervical stump are best treated by radium but it does not fall within the scope of this paper to discuss the technic and results of such treatment.

Attempts have been made to estimate the frequency of this condition after hysterectomy. Tarnier (1928) in 1164 cases found not a single instance. Albrecht (1928) found 17 in 4218 cases, 0.4 per cent; Sanders (1924) 18 in 2062 cases, 0.8 per cent; Tesaure, 10 in 1864 cases, 0.54 per cent. The records at the Howard A. Kelly Hospital offer no material which throws light on this subject. In none of the 46 under consideration was the original operation done in this hospital.

Polak states that the mortality is about $\frac{1}{2}$ per cent higher from a total hysterectomy than from a subtotal.

Drs. Kelly, Douay, and Bland Sutton have advocated coring the cervix in order to remove the glandular epithelium. Lincoln Davis reports a case where, eighteen months after a supravaginal hysterectomy and a thorough coring with cauterization of the cervix, a cancer developed in the stump.

The practical lesson to be drawn from this study is, first, that a thorough diagnostic exclusion of cancer either in the cervix or the body of the uterus should be made as a preliminary to a supravaginal hysterectomy; and, second, that patients who have had such an operation should be kept under observation and instructed that discharge or bleeding are abnormal conditions and that they should immediately seek medical advice on the first appearance of either of these symptoms.

It is interesting to note that the frequency of occurrence of these cancers is almost identical with the increased risk of a total over a subtotal hysterectomy. It is possible that the cervix might be destroyed with the cautery after a subtotal hysterectomy and the development of cancer prevented; but there is reasonable doubt as to this because we know that old burns on the skin and on other parts of the body are not infrequently the sites of cancer.

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ANEMIA IN PREGNANCY*

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INVESTIGATORS are not entirely agreed on the changes in the blood during gestation, since the reaction of the blood to the stimulus of pregnancy differs so much in various women. Older investigators (Audral and Gavarret, Regnault, Becquerel, and Rodier¹) considered the condition of the blood in pregnancy as one of chloranemia. Other writers (Schroeder, Carton, Zangemeister) stated that there was an increase in the red blood corpuscles and hemoglobin during the antenatal period.

The present study was undertaken to aid in clarifying the discrepancy of views and to determine the true blood picture of a large number of gravid women. An attempt was also made to ascertain the etiologic factors underlying the changes occurring in the blood.

Three types of anemia in the gravid state have been described. The first, the pernicious type reported by Channing in 1842, and the second, the severe hemolytic anemia, do not come within the scope of this investigation. The third, the so-called "physiologic anemia" of pregnancy, which we are led to believe should be termed "pathologic," forms the basis of this communication.

Since 1927 routine erythrocyte counts and hemoglobin estimations were made on all women registering in the prenatal clinic of the Jefferson Medical College Hospital. These examinations were performed by a qualified technician under the direct supervision of Dr. B. L. Crawford, director of the laboratory. The Thoma hemocytometer with the Leitz counting chamber and Neubauer ruling, was used for cell counting. The Dare hemoglobinometer was used to determine the percentage of hemoglobin. This instrument was standardized by the laboratory at intervals of two weeks, so that it was sufficiently accurate for the purpose of this study.

The normal low level for the erythrocytes and hemoglobin is arbitrarily placed at 3.5 million red cells per c.mm. and 70 per cent hemoglobin, respectively.

The patients were of the free "dispensary type" and were practically equally divided between the black and white races. Erythrocyte counts were taken on 1000 women in the various periods of gestation and on 200 women within forty-eight hours and seven to ten days after delivery.

*Read at a meeting of the Philadelphia Obstetrical Society, January 2, 1930.

The results of the erythrocyte counts and hemoglobin determinations in the different trimesters of pregnancy reveal the following:

1. *Erythrocyte Determination.*—In the entire group of 1000 patients, 474 patients, or 47.4 per cent, gave erythrocyte counts of 3.5 million per c.mm. or less, whereas only 16.1 per cent had an erythrocyte count of 4 million or over.

2. *Erythrocyte Counts According to Trimesters.*—Classification of the erythrocyte counts according to the trimester of pregnancy in which the test was performed, reveals that 121 patients were examined in the first and second trimesters, 722 patients in the third trimester, and 157 patients were examined during labor. Of the 121 patients examined in the first two trimesters, 24.7 per cent gave a count below 3.6 million; 56.7 per cent of the 722 patients examined in the last trimester gave evidence of a similar grade of anemia; and 21.7 per cent of the patients examined during labor showed less than 3.6 million red cells. Thus, it appears that the anemia is most marked in the third trimester with perhaps a slight improvement just before the onset of labor.

3. *Hemoglobin Estimations.*—The hemoglobin estimates of the 1000 patients were distributed as follows: A distinct hemoglobinemia (70 per cent or less) occurred in 586 patients, or 58.6 per cent, while only 129, or 12.9 per cent, of the women gave a hemoglobin percentage above 80.

4. *Erythrocyte Counts in the Puerperium.*—The erythrocyte counts of 200 patients were performed within forty-eight hours after delivery, and again seven to ten days postpartum in order to ascertain the immediate changes consequent upon childbirth. In 94 patients in this group, a count of over 3.5 million had been obtained during pregnancy, while in 106 patients an anemia was manifested equivalent to a count below 3.6 million.

In the former normal group of patients, 11.6 per cent showed an increase of over 200,000 cells within forty-eight hours after delivery, whereas 73.4 per cent showed a blood loss at this period.

In the latter group of patients exhibiting an anemia during gestation, however, 25.5 per cent gave no evidence of a further change within forty-eight hours after delivery; 16 per cent suffered a further reduction of over 200,000 cells per c.mm.; whereas 58.4 per cent showed a distinct gain over 200,000 erythrocytes per c.mm.

5. *Hemoglobin Determinations in the Puerperium.*—In this group of 200 patients a hemoglobinemia of less than 70 per cent had been obtained during pregnancy in 120 patients. Within forty-eight hours after delivery, 45 of this group no longer manifested this reduction. This recovery was even more marked within seven to ten days postpartum when 70 per cent of the patients with a hemoglobinemia during pregnancy now had a normal estimation.

DISCUSSION

The etiology of the anemia of pregnancy remains undisclosed. The withdrawal of iron from the maternal corpuscles by the growing fetus, the maternal blood destruction by a syncytial hemolysin in the ectodermal cells of the chorion as advanced by Hofbauer, the occurrence of a chloranemia, and the relative deficiency due to increase in blood volume are all probable factors in the production of this so-called physiologic anemia of pregnancy.

Experimental work to date indicates that in the latter half of pregnancy there is a definite increase in the blood volume. Kaboth, in 1924 estimated that the total increase in blood volume during preg-

nancy is about 400 c.c., while Gueissaz and Warner estimate the increase to be about 15 per cent.

It is believed that the loss of blood during labor and the withdrawal of the fetal blood are the two important factors responsible for the diminution of red cells after labor.

The data of Keith, Rountree and Geraghty point to the existence of an increased amount of blood and plasma during the latter half of gestation. The mean blood volume for women averaged 85.7 c.c. per kilogram of body weight. This increased in the latter period of pregnancy to 95.6 c.c. for each kilogram of uncorrected body weight. After delivery there was a large decrease in the absolute blood volume which was greater than could be accounted for by the loss at parturition. The average decrease in blood seven to ten days after delivery was 1100 c.c., whereas the average loss of blood at delivery was only 300 c.c., the volume of fetal blood accounting for the remaining 800 c.c. taken from the maternal circulation.

This dilution of the blood might manifest itself in a lowered red cell count. It is difficult to understand, however, how the condition of the blood in pregnancy is greatly influenced by this dilution, since, as pointed out by Galloway, the majority of the cases responded to treatment with iron and arsenic, liver therapy and the ultraviolet ray. The spontaneous recovery occurring in the puerperium would seem to indicate that much of the blood deficiency is primarily due to pregnancy per se and that the anemia did not exist prior to gestation. However, those patients who still manifested a distinct anemia or a progressive anemia after childbirth should be carefully observed until the blood deficiency has been corrected. It is interesting to note that of the 500 or more cases of pernicious anemia of pregnancy reported in the literature, there is no record of any prenatal supervision.

CONCLUSIONS

1. Although the true significance of pregnancy anemia is undetermined, a systematic blood examination is urged in the antenatal period of all patients.

2. Proper therapy should be instituted in all patients with blood counts well below the normal level.

NOTE.—The authors wish to acknowledge their indebtedness to Professor P. B. Bland under whose direction this preliminary report was made possible.

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1731 SPRUCE STREET.

1717 PINE STREET.

(For discussion, see page 123.)

VALUE OF ROUTINE RADIOGRAPHIC EXAMINATIONS OF THE NEWBORN, BASED ON A STUDY OF 702 CONSECUTIVE BABIES*

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RADIOGRAPHIC studies of infants had been of definite value in a considerable number of newborn, and we believed that a routine study of all infants born in a hospital might furnish data which would warrant an expense of about two dollars per infant. With the co-operation of the Hospital Board of Columbia Hospital, this study was started October 26, 1927, and ended December 7, 1929. During this period of study eleven babies who were born alive died in the hospital without having radiographic examinations. Six of these were premature and the others died from conditions such as cerebral hemorrhage (2), general anasarca (1), congenital bowel obstruction (1), and atelectasis (1). Four of the babies who were studied died. The plates on these showed the following findings: (1) Marked hydrocephalus with overdevelopment of frontal sinuses. (2) Marked atelectasis of both upper lobes of the lungs. (3) Extremely large heart and thymic shadow. Some atelectasis of both lungs. This infant was given one x-ray treatment. Autopsy showed a cerebral hemorrhage. (4) Very wide thymic shadow, and the heart shadow appeared larger than normal with some right-sided enlargement. This baby had one x-ray treatment. Congenital heart disease and lobar pneumonia were given as the cause of death.

A total of 702 infants were x-rayed one or more times. The technic was as follows: exposure $\frac{1}{10}$ second, distance 30 inches, 30 M.A., 60 K. V's. Forty-five per cent or 319 infants were normal from the radiographic viewpoint. Fifty-five per cent or 383 infants showed some abnormality on the plate. Enlargement of the thymus gland was the most common finding, some degree being present in 229 infants or 32.6 per cent. An abnormal lung condition was found in 184 infants or 26 per cent. An abnormal appearance of the heart was observed in 108 infants or 15 per cent. A detailed statement of the radiographic findings may be found in Table I.

The criterion of Wasson was used as a basis for the determination of thymic enlargement, that is, if the thymus shadow was twice the width of the second thoracic vertebra, the gland was measured at the

*Read at a meeting of the Chicago Gynecological Society, January 17, 1930.

TABLE I. NEWBORN INFANTS X-RAYED FROM OCTOBER 26, 1927 TO DECEMBER 7, 1929

| TOTAL NUMBER OF INFANTS RAYED | | 702 |
|--|-------------|------------|
| CONSIDERED NORMAL | | 319 or 45% |
| TOTAL ABNORMALITIES | | |
| | NO. OF EACH | PERCENTAGE |
| <i>Thymus:</i> | | |
| Markedly enlarged | 144 | |
| Moderate hypertrophy | 85 | |
| Total | 229 | 32.6 |
| <i>Lungs:</i> | | |
| Pneumothorax | 6 | |
| Increased hilus densities and increased peribronchial markings | 20 | |
| Increased hilus densities | 35 | |
| Poor aëration of lungs | 38 | |
| Atelectasis | 84 | |
| Interlobar septum between middle and lower lobe | 1 | |
| Total | 184 | 26 |
| <i>Heart:</i> | | |
| Large heart | 73 | |
| Long hanging type | 1 | |
| Peculiarly shaped heart | 1 | |
| Right-sided enlargement | 15 | |
| Heart displaced to left | 13 | |
| Small heart | 1 | |
| Dilatation of heart | 4 | |
| Total | 108 | 15 |
| <i>Miscellaneous:</i> | | |
| Hydrocephalus | 2 | |
| Excessive gas in stomach and intestine | 7 | |
| Marked widening of suture lines in skull | 2 | |
| Rickets | 4 | |
| Fractured clavicle | 4 | |
| Tenting of diaphragm | 1 | |
| Abnormalities of spine | 2 | |
| Large liver shadow | 1 | |

second interspace. The findings were dictated by the roentgenologist in the daily routine of radiographic dictation. While a total of 229 newborn showed some degree of thymus enlargement, only 20 or 7.6 per cent of those with hypertrophy had symptoms which led to x-ray treatment. As previously stated two babies who had one treatment each, died and it is doubtful whether the thymus had anything to do with the symptoms. It is possible that the thymus might not have caused the clinical symptoms in some of the other babies, nevertheless, improvement began within a few hours after the first treatment and recovery was complete in each case.

Approximately one-third of the babies studied were delivered by one of us (C. H. D.). An analysis of the records for 200 of these where the mothers had a similar type of prenatal care would seem to indicate that there is no apparent relationship between the size of the thymus and the age, parity, or physical condition of the mother.

TABLE II. TWO HUNDRED CASES WITH SIMILAR PRENATAL CARE* (C.H.D.)

| AGE OF MOTHER | NO. BABIES | NORMAL THYMUS | ENLARGED THYMUS |
|---------------|------------|---------------|-----------------|
| YEARS | | | |
| 18 to 20 | 7 | 4 | 3 |
| 21 " 23 | 17 | 10 | 7 |
| 24 " 26 | 37 | 19 | 18 |
| 27 " 29 | 51 | 35 | 16 |
| 30 " 32 | 40 | 29 | 11 |
| 33 " 35 | 23 | 13 | 10 |
| 36 " 38 | 16 | 7 | 9 |
| 39 " 41 | 9 | 8 | 1 |
| Primiparae | 100 | 65 | 35 |
| Para ii | 58 | 31 | 27 |
| Para iii | 26 | 14 | 12 |
| Para iv | 9 | 9 | — |
| Para v+ | 7 | 6 (62.5%) | 1 (37.5%) |

*Sixty per cent of these were delivered during first half year when tendency to hypertrophy of thymus seems greatest.

If we allow for the fact that 60 per cent of the personal cases were delivered during the first six months of the year when a higher percentage of newborn have hypertrophy of the thymus the percentage with enlarged thymus checks very closely with the entire series.

The 229 babies with hypertrophy of the thymus were charted according to the month of delivery, and it was found that this condition was most common in April and May. While some enlargement was recorded in the records of 123 boys, and 106 girls, it should be noted that 14 of the 20 babies treated were boys. Ten or one-half of all babies treated were born between March 1 and May 31.

TABLE III. THYMUS HYPERTROPHY, MONTH OF BIRTH

| JAN. | FEB. | MARCH | APRIL | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. |
|------|------|-------|-------|-----|------|------|------|-------|------|------|------|
| 15 | 7 | 20 | 26 | 30 | 20 | 20 | 20 | 18 | 23 | 16 | 14 |

TABLE IV. THYMUS CASES TREATED, MONTH OF BIRTH*

| JAN. | FEB. | MARCH | APRIL | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. |
|------|------|-------|-------|-----|------|------|------|-------|------|------|------|
| 2 | 1 | 3 | 5 | 2 | 0 | 1 | 3 | 0 | 3 | 0 | 0 |

*The two babies who died were born in October.

The physiology of the thymus gland is more or less unsolved. Marine in his comprehensive review of status lymphaticus indicates that there is a relationship between the thymus and the thyroid; also between the suprarenals, gonads and thymus; and that the size of the thymus gives no indication of its toxicity. Our observations seem to confirm this last statement.

Table I shows that 144 infants had a markedly enlarged gland and 85 had a moderate hypertrophy. Fourteen of the treated cases including two which died from other causes were in the first group and six in the second.

It is a common observation that symptoms are lessened within a few hours after the first x-ray treatment. Furthermore, complete relief is usually accomplished without an apparent decrease in the size of the gland. In this connection it must be recalled that the early effects of the x-ray would be a tissue edema with some increase in size rather than a decrease. In only a single instance was a definite decrease observed six days after treatment. Other cases have shown a persistent enlargement as long as two years after treatment. These observations lead us to believe that relief of symptoms comes from some change in the physiology of the thymus rather than a variation in its size.

The lung findings are of special interest to the obstetrician. Eighty-four infants showed atelectasis and 38 others poor aëration of the lungs, making a total of 122 or a little over 17 per cent who did not have adequate oxygen intake during the first hours of extrauterine life. This shows the necessity of aspirating fluid and mucus from the respiratory tract. Usually this can be accomplished with a soft ear syringe but a tracheal catheter must be used for the occasional infant who has thick mucus in the trachea. Oxygen should be given only after the mucus has been removed. It will usually clear up the color within a few minutes. Occasionally mucus will continue to bother for several hours. It is interesting that a spontaneous pneumothorax should be found in six or nearly one per cent of this group of newborn.

The variations in the heart shadow show that a considerable number of newborn have hearts which from the radiographic point of view are abnormal. Unfortunately we do not have a comparison between these and the clinical findings.

Among the miscellaneous findings it is interesting to note that only four infants showed evidence of congenital rickets. There was no evidence of congenital syphilis. Four babies had a fracture of the clavicle but no other fractures were observed. Other conditions such as hydrocephalus and spina bifida are obvious without the use of x-ray.

A radiographic study of the newborn furnishes interesting data for comparison with clinical findings but at present the expense does not justify its introduction as a routine test.

141 EAST WISCONSIN AVENUE.

(For discussion, see page 150.)

SPLENOMEGALY WITH HEPATIC CIRRHOSIS (BANTI'S SYNDROME) AS A COMPLICATION OF PREGNANCY, WITH THE REPORT OF A CASE

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THE following case is reported in some detail because of the uncommon association of pregnancy with splenomegaly and cirrhosis of the liver, and because of the fact that a diagnosis of Banti's syndrome was made and splenectomy performed during the second trimester of gestation.

We have been able to locate in the literature only three cases of splenomegaly in pregnancy. Allen¹ reported two cases in 1924. In the first of these splenectomy had been done five years before the beginning of the pregnancy, the removed organ weighing 770 grams. The gestation was normal except for moderately severe gastrointestinal disturbances. Labor began spontaneously one week after the calculated date and was terminated after sixteen hours by low forceps. The adherent placenta was removed manually. While the birth canal was being inspected, "the patient suddenly became cyanotic, took a few gasping respirations, and died on the table." Necropsy was not permitted and no explanation for the sudden death was adduced. The child was in good condition and was discharged alive. The second patient was first seen five weeks after the last menstrual period complaining of a mass in the upper abdomen and an evening rise of temperature. Although an exploratory laparotomy was done, the enlarged spleen was not removed. Two months later a diagnosis of aleucemic leukemia was made and x-ray therapy instituted. The patient went into labor two weeks before the calculated date and after seven and one-half hours was delivered by forceps of a five-pound, eight-ounce baby. Two hours after the normal delivery of the placenta a severe postpartum hemorrhage occurred which was finally controlled by pituitrin and tamponade. The secondary anemia necessitated a prolonged hospitalization, with the patient and her baby being discharged on the thirty-seventh postpartum day.

Six months later when the patient was again six weeks pregnant, a therapeutic abortion and sterilization were performed. The following month the spleen was removed and found to weigh 885 grams. There was no demonstrable lymphadenopathy and the liver was normal at the time of operation.

Birdsong, Hubert, and Whelchel² have reported a primipara of thirty-three years who first consulted them because of anemia when four months pregnant. For four years previously the patient had had severe menorrhagia and metrorrhagia, for which roentgen-ray therapy had been employed with some success. During the pregnancy the anemia became progressively worse until just before term the hemoglobin was only 23 per cent, and the red blood cell count 2,300,000. Labor began spontaneously and the delivery of a stillborn child was completed by version and extraction. During the second postpartum week, with the development of alarming symptoms of anemia, transfusions were employed. Unusual bleeding occurred again in the fourth week, along with fever and tachycardia. Since the spleen and liver were somewhat enlarged, a diagnosis of splenic anemia was made. Local applications to the interior of the uterus and roentgen-ray treatments finally

controlled the bleeding and the patient slowly convalesced. Three months after delivery, the red blood count was 3,270,000 and hemoglobin 65 per cent. The color index had been uniformly low, the differential count was never peculiar, and no abnormal cells were discovered. However, an unusual brown pigmentation of the skin seems to have been a prominent figure.

CASE REPORT

N. S., a white, married female, aged forty-two years, was admitted to the Department of Internal Medicine on August 3, 1928, complaining of a constant dragging pain in the lower left abdominal quadrant, of an intermittent enlargement of the abdomen, and of swelling of the ankles on exertion.

The family history was unimportant. The patient had had smallpox (?) at twelve years, influenza in 1918, no operations, and two full-term pregnancies (1918 and 1921), both spontaneous, and both children living.

For the past two years a gradual enlargement of the abdomen has developed. This swelling was intermittent, the abdomen increasing in size for a week at a time and then gradually receding. Since the spring of 1928, the abdomen grew constantly larger, although there was still considerable variation from day to day. Occasional dragging pains and sometimes a sharp pain in the left lower quadrant, especially on exertion, were observed. When the pain appeared it frequently persisted for twenty-four hours. For the past four weeks there was some edema of the ankles in the afternoons and evenings which disappeared on lying down. There was no general weakness or shortness of breath. A slight gain in weight was associated with good appetite and regular bowel evacuations.

Since April, 1928, the menstrual periods were irregular and very scant. The last period occurred on July 5, when there was only a stain of blood. For the past six to eight weeks a profuse leucorrhœal discharge was present.

Physical Examination.—The pulse was 88 per minute, and the blood pressure 140/60. The general examination was negative. A hard, smooth, symmetrical mass was present in the left upper abdomen, reaching to the umbilicus and medially to the midline, but not moving with respiration. In the middle of the lower abdomen there was another softer mass reaching out of the pelvis to two fingers above the symphysis. Pelvic examination (August 6) revealed a three months' uterine pregnancy with the adnexal regions clear. Cystoscopic examination and pyelograms (August 8) showed a moderate hydronephrosis and hydroureter on the right side but no demonstrable change in the left kidney. A colon x-ray series (August 13) was reported as showing: "Evidence of a mass on the left side of the abdomen with definite evidence of colitis of the descending and sigmoid colon, and angulations and redundancy of the descending colon." The urine (August 4) was normal. Blood study (August 4) showed hemoglobin, 65 per cent, R.B.C. 3,200,000, and W.B.C. 6,050, with 84 per cent polymorphonuclears and 16 per cent lymphocytes. Repeated blood counts gave similar results. Blood Wassermann reaction was negative. A special blood study showed:

Venous blood clotting time (capillary tube), 6 min.

Venous blood clotting time (Brodie-Russell), 8 min.

Capillary blood clotting time (capillary tube), 3½ min.

Capillary blood clotting time (Brodie-Russell), 4½ min.

Prothrombin time, 5.0, 6.0, 8.0, and 8.0 min.

Fragility of R.B.C. Began at 0.38 per cent and was complete at 0.30 per cent.

Blood platelets, 1.4 per cent.

Hematocrit, 28 per cent.

There was an afternoon rise of temperature from 99.0° F. to 99.6° F. with a pulse range of 70 to 96.

On August 24 the patient was transferred to the Department of Surgery with a diagnosis of splenomegaly, and on the following day splenectomy was performed through a right rectus incision. There was only a small amount of clear fluid in the peritoneal cavity. In several places the omentum was attached to the anterior abdominal wall by well-established adhesions. The liver, which extended halfway from the costal margin to the umbilicus, was cirrhotic and hob-nailed in appearance, but no malignant nodules were made out. The right lobe was about one-half normal size, while the left lobe was enlarged. The spleen, which was of a pale gray color and moderately firm, was removed without great difficulty after ligation of its vessels. There was little blood lost and the patient stood the intervention well.

Pathologic Report.—The spleen measured 19 x 10 x 6 cm. and weighed 600 grams. "The capsule is somewhat thickened. The malpighian corpuscles are not distinct, appearing atrophied and scarred. There is a considerable increase in the interstitial tissue in the pulp, and the vascular spaces are seen as small round vessels surrounded by fibrous tissue. Many polymorphonuclear and endothelial cells are found in the pulp. Phagocytosis of the red blood cells is quite prominent. Nucleated red cells are numerous. There is definite evidence of chronic irritation and the picture is not due entirely to chronic passive congestion. The picture is similar to that described in Banti's Disease.

"Diagnosis: Splenomegaly; fibrosis of the spleen; phagocytosis of red blood cells."

Convalescence was uninterrupted and on September 10, the patient was returned to the Medical Department feeling much better than before operation. The former abdominal pain and discomfort were gone, although the abdomen was still somewhat distended. Blood pressure of 120/50 and pulse of 96 were mean averages. The weight before operation was 113 pounds; after operation, 108 pounds.

On September 11, blood studies revealed hemoglobin 65 per cent, R.B.C., 4,000,000, and W.B.C., 13,300, with 78 per cent polymorphonuclear cells and 22 per cent lymphocytes. The second special blood study showed:

Coagulation time venous (capillary tube) 3 min.
Coagulation time venous (Brodie-Russell) 3½ min.
Coagulation time capillary (capillary tube) 2½ min.
Coagulation time capillary (Brodie-Russell) 3 min.
Bleeding time 50 seconds.
Prothrombin time 8.0, 8.5, and 9.0 min.
Clot retractility 1 hour.
Fragility 0.42 per cent to 0.36 per cent.
Arm band test negative.
Platelets 1 per cent.
Reticulocytes (8 in 500 cells) 1.5 per cent.

Since the temperature was not elevated and the pregnancy was proceeding normally, the patient was discharged Sept. 17, 1928, to return for delivery.

The patient was readmitted on November 26, to the Department of Obstetrics and Gynecology with complaints of shortness of breath and swelling of the ankles. The blood pressure was 150/75, but the urine was negative for albumin and casts. The plasma fibrin content was 0.46 per cent. The blood count showed hemoglobin (Dare), 55 per cent, R.B.C., 2,800,000, and W.B.C., 14,200, with 76 per cent polymorphonuclears, and 23 per cent lymphocytes. The weight was 129¾ pounds, a gain of 21¾ pounds in ten weeks. It seemed that some ascites was present, although the presence of the pregnant uterus interfered with its determination.

The patient was kept in bed on a restricted diet with the evident edema rapidly subsiding, but with the ascites increasing very rapidly, so that there was a gain of weight amounting to 16 pounds in the next three weeks, with a loss of $5\frac{1}{2}$ pounds just before delivery. No signs of toxemia developed, although the blood pressure remained somewhat elevated.

Spontaneous premature labor ensued on December 28, when, after a three and one-fourth hours' labor, a child weighing 2200 grams was born spontaneously. (The child did well on formula feeding and was discharged with the mother; weighing 2970 gm.) The blood loss at delivery was 250 c.c.

After delivery there was a slight intermittent temperature for two weeks with a high point of 101° F. on the third day. The urine output was diminished and diuretics had no appreciable effect. An ascites developed rapidly, with an increase in body girth at the umbilicus of 4 inches in seven days. Paracentesis was performed on January 8, when seven liters of clear straw-colored fluid were removed, which contained a heavy trace of albumin and showed 30 cells per c.mm. Following the paracentesis, the edge of the liver became palpable just above the umbilicus. The output of urine rose immediately, and the patient lost weight rapidly. The abdominal girth was reduced from 42 inches to 39 inches by the tapping, and during the next sixteen days receded to $32\frac{1}{2}$ inches with the complete disappearance of ascites. The patient was discharged on January 29 in excellent condition.

Follow-up examination on June 6, 1929 showed the liver edge 13 cm. below the costal margin. No free fluid could be demonstrated in the peritoneal cavity. There were no complaints referable to the abdomen. The blood pressure was 130/70.

No certain explanation can be offered for the complete disappearance of the ascitic fluid, although probably the attachment of the omentum to the anterior abdominal wall facilitated the establishment of a collateral circulation, which became adequate only after the decrease of the abdominal pressure by paracentesis.

The view that liver insufficiency frequently develops during pregnancy and that the toxemias of late pregnancy are due primarily to this insufficiency is hardly compatible with the nontoxic course of this gestation. Even with rather severe damage to the liver, this patient was able to carry a pregnancy for nine lunar months without the development of any symptoms of late toxemia (the slight hypertension can be explained on other grounds in the absence of other signs or symptoms of toxemia) although ascites was a prominent symptom of the latter part of gestation. Moreover, there was no evidence six months after parturition that pregnancy had aggravated the liver disease.

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HEMANGIOMA OF THE PELVIC CONNECTIVE TISSUE

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NO CASE of hemangioma of the pelvic connective tissue is recorded in the literature. Reder,¹ Siegel, Delaval and Marie,² and Wright³ report hemangiomas of the uterus. Wright's case possibly could be interpreted as arising from the cellular tissue rather than from the uterine wall.

The unique case herewith reported consisted of an enormous subperitoneal cavernous hemangioma. Six years previously, as the history will show, a similar but smaller and more localized mass was removed from the left broad ligament, together with the ovary and tube. The full clinical significance of the case will have to be left subjudice until further time has elapsed after the last operation, performed two years ago.

P. H., thirty-five years of age, unmarried, admitted to the Mt. Sinai Hospital Feb. 16, 1926, discharged March 13, 1926. Complained of abdominal pain of four weeks' duration. Last menstruation Jan. 20, 1926.

Six years ago the patient was operated upon at another hospital. A laparotomy was done, the report of which was only obtained some time after the patient was operated upon at Mt. Sinai Hospital. After this operation the patient felt well until quite recently.

For the last six weeks patient has noticed an enlargement of the lower abdomen. Four days before admission there was a feeling of distension and gurgling with cramp-like pains in the hypogastrium and lower back. There had been constipation and frequent and burning urination. During the last eighteen months the patient lost 20 pounds.

The patient's general condition was good. She was well nourished.

Abdominal examination showed a mass arising from within the pelvis and reaching on the right side to the level of the umbilicus. This mass appeared continuous with the uterus. A smaller mass was felt on the left side just reaching the pelvic brim. The cervix was found fixed high up, the pelvis being filled from brim to brim, the mass on the right appearing about the size of a melon, on the left side a smaller mass was noted not descending as deeply into the pelvis. White blood count was 13,000, polynuclears 76 per cent, mononuclears 4 per cent, lymphocytes 20 per cent; blood sedimentation time one hour and forty-three minutes; blood pressure 142/80; hemoglobin 55 per cent. The diagnosis of intraligamentous cysts or less likely, a chronic stage of pelvic inflammatory disease (tuboovarian) was made.

Operation: Median subumbilical incision exposed a bluish red, polycystic edematous mass rising to the level of the umbilicus. After packing back the nonadherent intestine, by blunt separation the fundus of the uterus was exposed. From the right horn of the uterus the right tube could be traced outward and backward, and a perfectly normal looking ovary was likewise found, both of these organs riding on top of the tumor mass. The left side of the pelvis showed the absence

of the tube and ovary. The bladder was found much elongated, almost tubular in shape and, separating it from the uterus, was neoplastic tissue similar to the rest. The sigmoid colon disappeared into the pelvis behind the mass which adhered closely to the bowel (Fig. 1). The prospect of removing this neoplastic conglomeration seemed poor but an attempt was made nevertheless. Although bright blood was obtained when the "cysts" were punctured, the diagnosis of "hemangioma" was not arrived at, perhaps fortunately for the patient, because I believe that I would hardly have had the temerity to attempt its removal if I had recognized the direct connection of the growth with the vascular system.

In order to make progress, numerous "cysts" were torn and punctured and, as opened, compressed with large pieces of gauze in order to gain room and control the hemorrhage. By this method, as if squeezing out and compressing a sponge, the infundibulo-pelvic ligament on the right side was reached. Starting from there, by means of the technic associated with Kelly's name, the pelvis was cleared, going from right to left, cutting across the cervix of the uterus when this was reached, and with a great deal of difficulty, shelling the distorted and friable

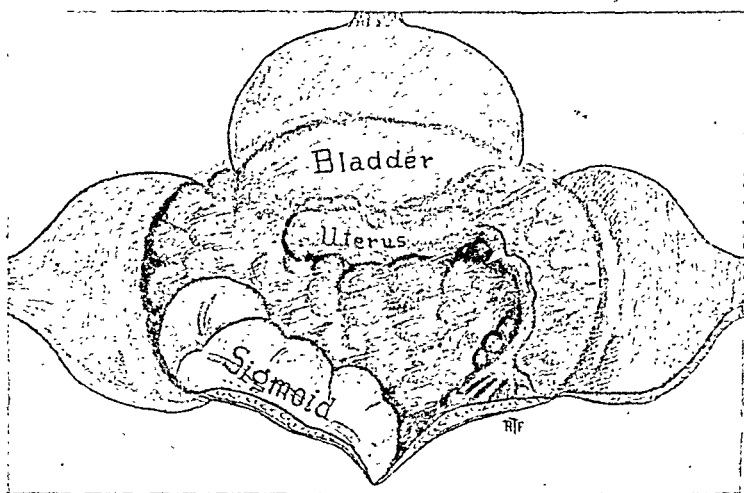


Fig. 1.—Hemangioma of pelvis. Subperitoneal tumor, showing normal right adnexa. The left adnexa were removed at a previous operation.

bladder from the growth. Although innumerable blood vessels had to be tied, no large nutrient vessels entering the cystic masses were encountered. The entire mass was subperitoneal, except anteriorly where it had apparently broken through the anterior culdesac and loosely attached itself to the posterior surface of the bladder and the anterior surface of the uterus by innumerable, delicate connective tissue fibrils, without, however, penetrating into the substance of either of these viscera. Owing to the previous operation, the only anatomical structures definitely identified were the right infundibulo-pelvic ligament and the right and left uterine arteries. After the pelvis was cleared the pelvic cellular tissue, almost down to the perineum was plainly in view, apparently entirely freed of neoplasm. Subperitoneal drainage was instituted through the cervical stump and the wound entirely extraperitonealized by utilizing the bladder peritoneum and sigmoid.

Convalescence was uneventful.

Macroscopically, the removed tumor was completely collapsed, spongy tissue, occupying less than $\frac{1}{4}$ of the original mass, hanging like streamers from the sole loose attachment left, namely the posterior surface of the uterus.

Microscopically, as can be seen from Fig. 3, the tumor tissue consisted of a

simple cavernous hemangioma the septa consisting of very loose, soft, edematous fibrillar connective tissue. In no area were malignant changes to be found nor did proliferation of the vessel endothelium occur. The diagnosis of hemangioma was therefore made.

This tumor mass showed no intimate relations with either the uterus, the adnexa, the intestines, or bladder. Its point of origin, therefore, must have been the pelvic cellular tissue.

Subsequent to the operation, a report was received from Dr. F. B. Orintine of St. Anthony of Padua Hospital, Chicago, Illinois, in which the pathologic report of the tumor of the broad ligament removed six years previously was given. "A bloody, stringy, fleshy mass, the size of a large grapefruit was removed from the left broad ligament. It consisted of a mass of immature connective tissue with numerous interlacing capillary spaces filled with blood."

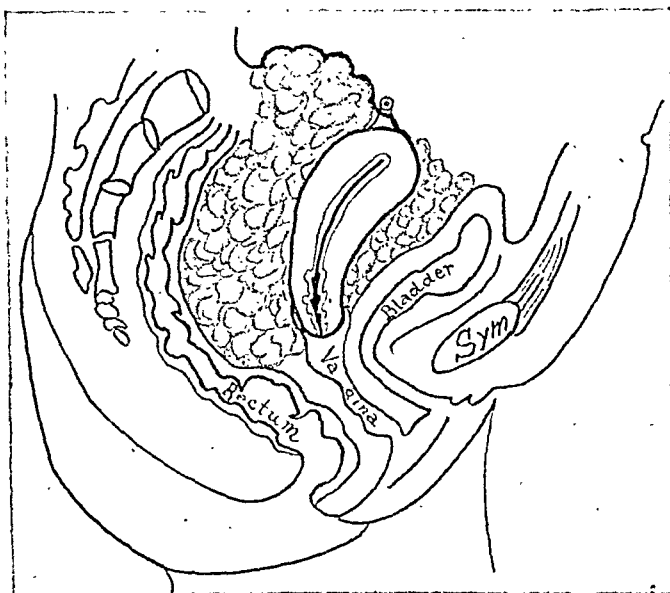


Fig. 2—Schematic sagittal section showing relation of growth to the rectum, uterus and bladder.

This agrees exactly with our findings except that the then diagnosis of "fibroma of the broad ligament" was, in my opinion, erroneously made.

In spite of the fact that this tumor recurred after an interval of six years, I do not consider the neoplasm truly malignant but believe that the recurrence originated from portions of the mass left behind.

Exactly two years after this patient had undergone her second operation, reoperation was performed because of recurrence in the left side of the pelvis.

Relaparotomy (Feb. 14, 1928) exposed a tumor identical with the previous ones. The mass was entirely retroperitoneal but had grown above the bladder. In separating the bladder from the growth, this viscus was torn into. The bladder wound was now enlarged and with fingers in the bladder and the fingers of the other hand in the vagina, it could be determined that operation was impossible because of the wide extent and diffuse distribution of the mass. The bladder injury and incision was therefore repaired and the abdomen closed. Convalescence was uneventful.

On Feb. 29, 1928 radium was applied per vaginam and over the abdomen and buttocks. In all, 19,250 mg.hr. were given.

Two years have elapsed. The patient is in good health. The mass, which filled the entire left side of the pelvis is now firm, hard, and no larger than a small orange.

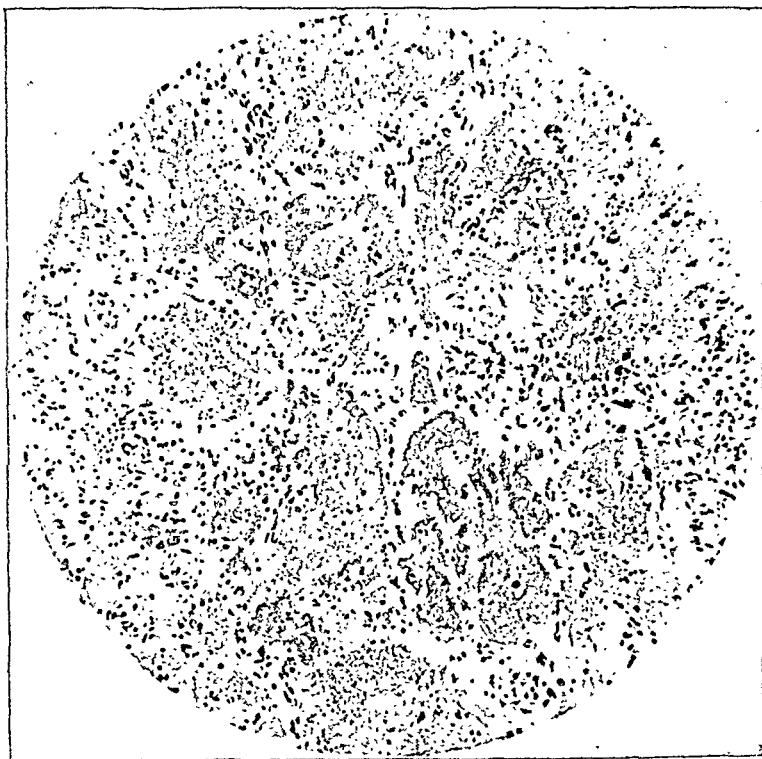


Fig. 3—Photomicrograph, low power. Cavernous sinuses filled with blood are bounded by thin-walled septa consisting of loose embryonal connective tissue.

This rare mesenchymal tumor in distribution and clinical course resembles a retroperitoneal lipoma, which likewise has the tendency to recur.

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10 EAST EIGHTY-FIFTH STREET.

MENSTRUAL PERIODS INDUCED IN OVARIECTOMIZED MONKEYS BY ESTRUS-PRODUCING OVARIAN HORMONE

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IN EXPERIMENTS previously reported,^{1, 2} it has been demonstrated that active extracts of ovaries and placenta will substitute for the endocrine function of the ovaries to the extent of producing full estrous growth in ovariectomized laboratory animals and experimental menstrual cycles in ovariectomized monkeys. These experimental cycles in ovariectomized monkeys are similar to the nonovulating type of menstrual cycle in normal monkeys (Corner³) in that the uterine glands fail to develop beyond the interval condition. The interval hyperplasia of the epithelium of the whole genital tract and mammary glands and the secretion of glycogen by the glands of the uterus, the premenstrual edema, and the menstrual hemorrhage of the endometrium are typical menstrual phenomena. The hyperplasia of the genital epithelium and the secretion of the uterine glands definitely result from action of this hormone. The edema and menstrual hemorrhage follow several days after cessation of hormone administration. Therefore this hormone alone is sufficient to induce menstruation experimentally.

Corner and W. Allen⁴ and Hisaw and Leonard⁵ have shown that specific extracts of corpus luteum ("progestin") following administration of the follicular or estrus-producing hormone will carry development of the uterine glands of the rabbit to a progestational development and those of the monkey to a full premenstrual condition. Allen, Pratt, Newell and Bland⁶ have demonstrated that there is considerable follicular hormone in corpora lutea at the same time that this specific factor described by Corner and Allen and by Hisaw and Leonard is operating. Just how these two active principles are balanced is only partly understood but Hisaw's work suggests a rather delicate quantitative balance.

The experiments described below concern results obtained in two ovariectomized monkeys from hormone administered by the vaginal route. The subcutaneous injection method of administering ovarian hormone when used at brief intervals over considerable periods of time becomes objectionable to patients. It has previously been shown that oral administration is very inefficient in that 20 or more times the minimal dose when given by injection is required by mouth for a positive reaction (Loewe, Lange and Faure⁷). This hormone is read-

ily absorbed from the peritoneal and uterine cavities (Allen⁸). Recently Pratt and Smeltzer⁹ have demonstrated effective absorption of hormone dropped into the conjunctival sac and sprayed upon the mucous membrane of the nasal cavities. Powers, Varley and Morrell¹⁰ have reported effective absorption through the walls of the vagina of the monkey, the hormone being administered in the form of gelatin pessaries. The following is a brief report of two experiments tried in our laboratory with similar preparations of this hormone ("Amniotin," Squibb).

The ovaries were removed from two adult monkeys of 42 and 45 kilograms body weight and then considerable periods of castrate atrophy allowed to elapse. During this time the red color of the "sexual skin" faded. Then the hormone was administered by inserting gelatin pessaries into the vagina twice daily for twenty-four days. Dosage began with 10 rat units per day, was increased gradually to 80 units by the fifteenth day and maintained at this level until the end of the experiments. A total of more than 1160 rat units of hormone per monkey was distributed through twenty-four days.

By the fifth day of injections the "sexual skin" had reddened considerably and this color deepened as the injections were continued until a maximum reddening had been induced by the end of the second week of injections. After hormone administration was stopped nothing happened for six days except a slight fading of the color of the "sexual skin." On the morning of the sixth day after stopping hormone administration both animals began menstruating. These experimental menses were quite prolonged, lasting in the first monkey for nine days and in the second for seven days, or nearly twice the length of the usual period. Bleeding was more profuse than during normal menses. Toward the end of these experimental menses the amount of flow decreased but considerable numbers of red blood cells could be identified in vaginal smears. The latent period of six days between discontinuance of hormone administration and the onset of the experimental menses is nearly twice as long as the average of previous experiments. The flow was much more profuse.

From the above facts we are inclined to consider the administration of this hormone by the vaginal pessary method more effective than by subcutaneous injections of water preparations.

During the course of hormone administration overnight samples of urine were collected, extracted for excreted hormone and the extracts tested by injections into spayed rats. It was found that when 80 rat units of hormone per day were being administered that at least 4 rat units (possibly greater amounts) could be recovered in overnight samples of urine. It is probable that lighter doses of hormone as described by Powers, Varley and Morrell, would have proved effective.

We were, however, interested in inducing maximum conditions rather than in establishing a minimal effective dose.

SUMMARY

Two ovariectomized adult monkeys were given twenty-four days' continuous treatment with estrus-producing, ovarian hormone. This active substance ("Amniotin," Squibb) was administered by gelatin pessaries inserted into the vagina twice daily. The total dose exceeded 1160 rat units per animal. Maximum coloring of the "sexual skin" was induced.

A "latent" period of six days followed cessation of hormone administration. Menses began in both monkeys on the sixth day after the last dose. Duration of menses was nine days in one animal and seven in the other or nearly twice the usual period. The flow was more profuse than noted in normal monkeys or during experimental menses previously induced by hormone injections in ovariectomized monkeys.

During hormone administration it was possible to recover some of the active material excreted in the urine.

It would seem that administration of hormone in gelatin pessaries by the vaginal route is more effective than subcutaneous injections of water preparations. Surely it should prove less objectional to patients.

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Eclampsia is always severe, although variable in severity, symptoms and clinical findings and is associated with extremely high fetal and maternal mortality. Seventy per cent of the deaths in the first pregnancy are due to eclampsia. Anemia and oral sepsis are frequently found. When eclampsia recurs the fetal and maternal prognosis is definitely worse. In albuminuria there is a similar but less likely danger to that of eclampsia recurring.

Three weeks of hospitalization following delivery is strongly urged with repeated clinical and laboratory procedures. Succeeding pregnancies are entitled to the strictest observation and management. About twenty per cent of the pregnancies occurring after eclampsia have some degree of toxemia, while almost fifty per cent of the repeat pregnancies after albuminuria develop toxemia. The earlier the occurrence and the longer the duration, the more likely the residual lesion in the kidney.

AXIAL ROTATION OF THE PREGNANT UTERUS

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(From the United Israel Zion Hospital)

THE anatomically normal uterus, whether pregnant or not, is rotated around its long axis from right to left, so that the transverse diameter between the two cornuas is not parallel to the transverse diameter of the pelvis but the right cornua is slightly closer to the anterior abdominal wall than the left one. This physiologic torsion is very slight in the uterus of normal size and shape, but becomes more pronounced and more easily recognizable in the pregnant organ, although it never exceeds more than a few degrees.

The normal sized and shaped nonpregnant uterus cannot turn around its long axis beyond the physiologic degree, but the tumorous and the pregnant uterus can twist itself to a measure whereby the ratio is no longer commensurate with the normal mobility of the organ.

Küstner believes that an abnormal torsion of the uterus in the early stage of pregnancy is not exceptional. It either corrects itself as the organ grows out of the small pelvis or induces an abortion just as an incarcerated retroflexed, retroverted uterus would do. This twist of the pregnant uterus in early gestation, he denominates as "torsion of the uterus" distinguishing it from those very rare cases which may occur in the latter half of pregnancy and which he prefers to call more appropriately "axial rotation of the uterus."

In this paper we shall adhere strictly to the foregoing terms believing that this will obviate confusion. Hitherto in the literature no distinction has been made between torsion and rotation but both have been used indiscriminately.

Torsion of the uterus is a peculiar condition, inasmuch as the uterus is not only twisted on its long axis, but this axis is also declined from the upper right to the lower left side of the pelvis. In such cases, on bimanual palpation the cervix is felt pointing to the left and the fundus lies in the right hemisphere of the pelvis. Sometimes the upper part of the elongated cervix might be mistaken for the uterus proper and the mass to the right considered to be a tubal pregnancy. Olshausen declines the diagnosis of "torsion" for these cases and assumes that they are rather a lateral flexion. Küstner takes the stand, and we believe rightly, that the gravid uterus hardly can become flexed on its side. However neither opinion has been as yet confirmed by direct visualization.

A much more serious condition is the axial rotation of the uterus. The degree of rotation is sometimes as much as 180 degrees or more. It most often occurs in association with uterine and adnexal growths in nonpregnant uteri but is of exceedingly rare occurrence in the second half of pregnancy. In the survey of the literature for axial rotation in pregnant uteri we found only ten cases, one each by Kiparsky, Stork, Kohler, Glinski, Olow, Calman, Schindler, Vogt and two by Weinzierl. We desire herewith to present the eleventh case:

Of these cases, anatomical abnormalities were found in three, i.e., in Kiparsky's, Calman's and Schindler's case the rotation occurred in the pregnant horn of a uterus duplex unicollis. In Stork's and Vogt's cases anamnestic data were obtained as to an operative procedure previous to the pregnancy in which the rotation occurred. In the latter, a plastic operation was done for the correction of a cystocele, in the former two operations were performed, one for an ovarian cyst adenocarcinoma and a second for the freeing of adhesions. In one of Weinzierl's cases, a sinistroscoliosis of the dorsal vertebral column was present. In the other five cases, no gross anatomical changes were found.

As to the factors and mechanism which bring about the rotation, several theories have been advanced, the variety of opinions depending either on the concomitant incidents or in the absence of these, the explanation becomes purely speculative.

For the sake of clarity it seems practical to us to divide the question and ask first, what are the structural potentialities, if any, that will make for a predisposition and second, what dynamic momentum is in play that actually twists the uterus around?

In the three cases of uterus duplex unicollis, the potentiality of rotation was considered to originate in the same factors that commonly bring about the torsion of ovarian cysts. From a morphologic point of view the similarity is striking, inasmuch as in both conditions we are dealing with a pedunculated spherical organ. Also in certain ruminants as in cows, sheep, goats, and, as an exception, sometimes in horses, veterinarians report the occurrence of axial rotation. These animals possess a duplex uterus and usually only one horn is pregnant. The predisposition for rotation in these uteri is that they possess mesometrium on one side only, therefore endowing them with unusual mobility.

Stork and Vogt believe that the operations performed some time previous have brought about some unusual fixation of the uterus and Weinzierl in one of his cases bases the potentiality of the rotation on the sinistroscoliosis of the mother's spinal column, a condition which always changes the topographical relation between the abdominal organs.

Of more interest than the anatomical abnormalities is the question as to the rotating momentum. Here too we find a great diversity of opinion which would present itself even if the structural and formal conditions were identical in all cases of axial rotation of the uterus.

Sellheim, in a most exhaustive study, discusses the rotating momentum of internal organs, especially of ovarian cysts, and reaches the conclusion that it is a rotating motion of the bearer's trunk which is transmitted to the organ and causes it to become twisted in the same direction that the body has turned. This is borne out in several cases of ovarian cysts where the torsion of the pedicle occurred while dancing or in the case of mowing with a scythe. Sellheim proved his theory very conclusively in experiments. He was able to bring about the torsion of ovarian cysts by the patient's execution of certain swaying motions of the trunk. In Kiparsky's, Calman's and Olow's cases the transmission of the rotating momentum from body to organ is well established because the onset of symptoms was sudden and followed immediately upon some physical exertion, which when analyzed had the essential characteristics of a swift turn. In the majority of axial rotations, however, no such factor can be called in account.

Under the influence of the preliminary labor pains in the last weeks of pregnancy, the uterus rotates slightly in order to adjust its most flexible parts to the curve of the birth canal and according to Störk and Kohler, if a primary insufficiency of the myometrium and an unqualified tonus of the musculature exist, the lower uterine segment will not be able to resist the rotation of the fetus but will be carried along with it and secondarily the rest of the uterine body will be carried around also. That these preliminary contractions of the uterus might play an important part in the development of axial rotation is substantiated by the fact that in a few cases the condition did not come about as acutely as in those in which a sudden motion of the body was accounted for as the cause, but ten or twelve days prior to the aggravation of symptoms, pronounced and intermittent labor pains were present.

A very interesting though hardly acceptable explanation is Payr's hemodynamic hypothesis. According to this theory the engorged veins of an organ as they become more and more tortuous, wind themselves around the arteries and thus secondarily twist the surrounding structures with them. This interpretation will fit organs of delicate structure and weight, as in the torsion of the fallopian tubes but doubt may be entertained whether the force behind such tortuous veins even with an increased pressure within them is sufficient to rotate the pregnant uterus.

Kiparsky considers a relaxed and pendulous abdomen and a sudden one-sided contraction of the abdominal wall to be the reason for the rotation. But this cannot gain general acceptance because rotations were observed in patients who did not suffer from such a condition. Kittel is of the opinion that the changing fullness of the bladder with the peristalsis of intestines may cause the twist of an internal organ and Küstner is inclined to accept the influence of an uneven weight

distribution brought about within the organ by postural changes, as a cause for rotation.

Likewise, an exaggerated physiologic rotation was thought of as the twisting impulse (Glinsky) but this may be rejected by reason that two of the eleven cases showed a rotation from left to right, i.e., against the direction of physiologic rotation. Weinzierl in one of his cases believes that an attempt to bimanually rotate a deep transverse arrested occiput was the factor.

In our own case no anatomical abnormalities were revealed as a possible predisposition to a rotation, nor did the patient disclose any incident which we could interpret as being a contributing factor. However, we believe that the underlying cause which will allow the rotation of the uterus on its long axis is essentially in its loose attachment of its suspending apparatus to the bony pelvis. It seems improbable that the broad and round ligaments could give way to the rotating force at the time that the twist occurs would they not be elongated prior to the actual occurrence. Just as volvulus of the intestines is made possible by a long mesentery with a narrow attachment, in axial rotation an unusual amount of independence is rendered to the uterus by an abnormal length of the broad and round ligaments. It is possible too that an elongated cervix is an additional agent. The uterosacral and vesicouterine ligaments, being attached to the cervix, do not have to give so extensively during the stretching as the other ligaments, especially inasmuch as the rotation pivot is usually in the cervix or in the cervicovaginal junction.

The preoperative diagnosis has never been made, but the condition has been found as a unique surprise either at operation or at autopsy. The symptoms develop during or before labor and they are: intermittent abdominal pain either antecedent to an abdominal shock or concurrent with the collapse, peritoneal irritation, internal hemorrhage, vomiting, etc.; in other words, the signs of acute strangulation of adnexal tumors, uterine rupture, ablatio of the placenta, or ruptured ectopic. A vaginal examination meets an obstruction so that the presenting part cannot be reached.

Of the eleven reported cases, two were diagnosed at autopsy in which retroplacental hemorrhages were in evidence as responsible for the fatality. In the other nine, various diagnoses indicated the necessity of transabdominal operative deliveries and classical cesarean section, Porro or semi-Porro operations were performed. Stork placed the uterine incision on the posterior surface of the uterus as it was in situ anteriorly, similar to our own case.

In three of the cases, including ours, the child was in a transverse position, in two cases the occiput was arrested in a posterior position and in the others no mention was made as to the position and presentation of the child.

CASE REPORT

Mrs. A. D., aged thirty-eight, Italian, nullipara. Estimated date of confinement March 10. At her first visit to the prenatal clinic on January 7, a peculiar contour of the abdomen suggested the possibility of a monster or twins with hydramnios. An x-ray picture at this time revealed a single fetus lying in the transverse position with the head in the right iliac fossa. Otherwise the general examination was negative, the pelvic measurements were found ample, blood pressure and urine normal.

She was advised to return to the clinic on the following day, in order that an attempt might be made to correct the malposition by external version. She failed to do so however, and was lost sight of until her admission to the Israel Zion Hospital on March the first in active labor, having mild pains every five to ten minutes. Onset of labor four hours previous to the admission.

Abdominal palpation revealed the fetus still lying in a transverse position. Rectal examination showed the cervix to be one finger dilated and very thick; unable to reach presenting part; membranes intact.

An external version was attempted under anesthesia but was unsuccessful owing to the fact that we were unable to mobilize the baby or even dislodge the head from the right iliac fossa. Following this procedure the patient was put to bed and the labor allowed to continue. During a period of four hours the pains were weak and ineffectual, the fetal heart sounds were regular and of good quality. Following this, however, immediate delivery by the abdominal route was deemed imperative in view of the fact that the labor pains were increasing in intensity and frequency with almost no period of relaxation between them. The entire uterus appeared spastic and the lower segment was particularly tense, the cervix was rigid and approximately 2 cm. dilated.

Under spinal anesthesia the abdomen was entered by a low midline incision extending from below the umbilicus to the pubis. Upon exposure, very much to our surprise the uterus was found to present its posterior surface anteriorly as the result of an axial rotation of approximately 160 degrees. A striking feature was the tremendous varicosities of the vessels coursing along the lateral margins of the uterus, particularly those of the lower segment. The right horn of the uterus was rotated to the left side of the abdomen, and the right adnexa tremendously engorged and edematous, the tube suspended like a tense sling across the presenting surface of the organ. The left adnexa were not visible. It was found impossible to rotate the uterus back to the normal position without eventration, owing to the fact that it had wedged itself firmly into this acquired anomalous position. It was therefore deemed advisable to enter the uterus in situ through a vertical incision on the posterior surface. The fetus was extracted without any difficulty and the placenta allowed to separate normally before removal. The uterine incision was closed with interrupted chromic No. 2 sutures. The empty and contracted uterus was now rotated back to its normal position and at this time it was extremely interesting to note the rapidity with which the dilated varicose vessels collapsed and assumed a normal appearance. The abdomen was closed in the usual fashion and the patient made an uneventful recovery.

In conclusion we deem worthy of particular emphasis the fact that at no time did the patient have any subjective symptoms which would have indicated the presence of this unusual complication and that furthermore in the prenatal history there is no incident which might be interpreted as a potent factor in the causation of this axial rotation, nor were any developmental defects of the uterus found at operation which might explain the occurrence.

We are also certain that our attempt to correct the transverse position was not responsible for the subsequent findings, because during this maneuver the child's

head never left the right iliac fossa. It would be illogical to infer that during this attempted version the uterus alone was twisted leaving the child in its original position.

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TRICHOMONAS VAGINALIS*

By H. DAWSON FURNISS, M.D., F.A.C.S., NEW YORK, N. Y.

ALTHOUGH the *Trichomonas vaginalis* was described by Donné in 1834, only scant mention of it as a pathogenic organism was entertained until recent years when it was brought to our attention through the works of DeLee, Greenhill, and Carl Henry Davis.

The importance of it was first suggested to me by Dr. Frederick Holden in May of last year. It was my good fortune to find the *Trichomonas* in my first search. While this report concerns itself with only 35 cases, I have had many more.

Aside from gonorrhea, I believe that most of the leucorrheas seen are due to this organism, especially where the discharge is due to inflammation of the vagina. Only rarely has the organism been found in the cervix, as the alkaline secretion is inimical to its life.

Williamson (J. A. M. A., Feb. 16, 1929) found the *Trichomonas* in 1.91 per cent of 1,148 food handlers of Chicago.

In the *Journal of Parasitology* 14: 261, June, 1928, Hagner reports cultivating the *Trichomonads* from the intestinal tract of the monkey (*rhesus macacus*) on serum-saline-citrate media, and injecting them into the vaginas of 6 monkeys of the same species in which 6 examinations upon each had proved negative for *Trichomonads*. In all the *Trichomonads* lived for two days, and in 2 a persistent infection was produced. Cultures upon these 2 monkeys on the same media were injected into the vaginas of the 4 monkeys which had failed to develop an infection, and in 2 of these a *Trichomonas* infection developed. In these specie of monkey the *Trichomonas* is often found in the vagina, and Hagner is of the opinion that the intestinal and vaginal protozoan are the same, as he has been unable to determine any morphologic difference between them.

*Read at a meeting of the New York Obstetrical Society, February 11, 1930.

There were 35 cases in the series on which this analysis was made. They were evenly distributed from twenty-three to sixty years of age; two of them were twelve and fourteen years old when the trouble was first noted. As far as I can determine, age is not significant. I am sure it will be found that many of the cases that we have called senile vaginitis will prove to be due to the *Trichomonas*. There were 24 married and 11 single, three of whom were undoubtedly virgins.

The history indicated that 6 started during pregnancy, 3 of whom were pregnant when the *Trichomonas* was discovered.

Three were known, definitely, to have had gonorrhea, and one had the double infection at the time of the first examination. One had been treated for five years, and another for eleven before the true nature of the trouble was discovered. One who had been pronounced cured of the gonorrhea returned after two months with a profuse discharge, with numerous *Trichomonas* and no gonococci. Two were accused by their husbands of causing an urethral irritation. In one of these neither the gonococcus nor the *Trichomonas* were found; however, several days had elapsed before the trichomona was looked for. I do not know what was found in the husband of the second case, but gonorrhea could not be demonstrated in the wife.

Three had urethritis which was relieved when the *Trichomonas vaginalis* vaginitis was cured.

As far as could be determined from the histories, the duration was from one week to eleven years, the majority being of a few months' duration, but with about one-fourth running into years. The infection usually had an acute onset.

On a scale of four to represent the degree of irritation and discharge, 12 could be classified as 1, 13 as 2, 8 as 3, and 2 as 4. Some had only slight discharge, and moderate irritation; others profuse discharge and vulval inflammation; at times there was superficial ulceration in the vagina. Three had marked dyspareunia, and with two of these intercourse was impossible on account of pain. Two of the virgins fell in Classes 3 and 4. Three of them had had complete hysterectomies showing that the infection is not dependent upon a cervical lesion.

There have been many treatments described, but I have found nothing better than a simple 1-4000 bichloride of mercury douche, given for the first week twice a day, and later once daily. The douche should be continued during the menstruation at a temperature of 100° F. Only occasionally has it been necessary to use a weaker solution, and in none has there been any evidence of mercurial poisoning. The relief has been prompt, and at times almost magical. The organisms have usually disappeared in three to five days, and rarely have they returned.

Of the 35 cases, 24 were cured. Three remained uncured; the duration of observation was so short in two of these that it is difficult to say what the result will be with longer treatment; two of these were free

of organisms for a time, but at the last examination they were found. Six have been lost sight of since the trouble was diagnosed; they are out of town patients, and it is reasonable to suppose that just as great a percentage of them has been cured.

In using the term cured, it is meant that no organisms have been found in the last few examinations. It is fully realized that these patients are liable to reinfection in the manner in which it was first contracted. Until we have determined how this comes about we shall be at a loss as to how to protect them against recurrences.

Many of them cleared up after two or three irrigations. This work was started in the early summer when patients were leaving for their vacations and I for mine, so it is difficult to determine the length of time it took to bring about a cure. Including the long periods in which many of these patients were not seen after beginning treatment, the total time for the 24 cured patients was 106 weeks, or an average of 4.4 weeks per patient before the organisms disappeared.

The relief of symptoms is prompt, the organisms quickly disappear and even should a reinfection occur, relief can be again brought about.

Until we learn more of the life history of the *Trichomonas* and its method of introduction into the vagina, we cannot assure our patients that they will not have recurrences.

I feel that the more general recognition of the *Trichomonas vaginalis* as a cause of vaginitis has been one of the important features in conservative gynecology.

54 EAST SIXTY-SECOND STREET.

(For discussion, see page 113.)

POSTPARTUM ATRESIA OF THE VAGINA

WITH A REPORT OF A CASE OF HEMATOCOLPOS, HEMATOMETRA,
AND HEMATOSALPINX

BY A. E. KANTER, M.D., F.A.C.S., AND A. H. KLAWANS, M.D.
CHICAGO, ILL.

(From the Departments of Gynecology, Cook County Hospital and Rush Medical College)

POSTPARTUM atresia of the vagina is an extremely rare condition, particularly when accompanied by a complete retention of menstrual blood. Stenoses of the vagina are reported in a great many instances, but a thorough search of the literature has failed to reveal a single case similar to the one here reported.

Postpartum atresia of the vagina may follow operative deliveries where the bladder and pelvic floor are greatly relaxed with the result that the anterior and posterior vaginal walls lie in approximation.

In such cases irregular tears are very often produced, and even after suturing the approximated vaginal walls have a tendency to adhere. Atresia also occurs in cases where vaginal tears are left unsutured, the raw surfaces coming into contact with each other and adhesion results. This is much more likely to happen where infection of the raw edges has been present.

Occasionally, with failure to completely visualize the extent of an irregular tear, the anterior and posterior vaginal walls are sewed together.

In patients where an ulceration of the vagina follows the use of strong antiseptics in preparing the patient for vaginal examination or delivery, the ulcerated surfaces may come into contact and atresia follow.

In those patients who develop a membranous puerperal vaginitis (diphtheritic, staphylococcic, streptococcic, nonspecific), the vaginal walls may come into contact and the membranes form the basis for the atresia.

With the proper amount of caution, and with obstetrics in the hands of capable practitioners, prevention of postpartum atresia of the vagina should prove rather simple.

Every postpartum patient should be examined vaginally before she is allowed to leave the hospital, and again five to six weeks after delivery. This will at once reveal any slight tendency toward the production of an atresia, and steps for prevention can be immediately instituted.

The treatment of this condition depends on the location of the atresia, the extent of the surfaces involved, and the length of time it has been present. In the majority of cases, when of recent origin, the adherent surfaces can be readily separated by blunt dissection with the gloved finger. Particular care must be taken in this dissection to prevent the production of vesicovaginal fistulas.

In patients where the atresia has been of long standing, sharp dissection is employed, one finger being inserted into the rectum and the bladder being lifted as far away as possible by means of a retractor. Dissection is continued until the adherent vaginal walls are entirely separated, the greatest caution being constantly observed to prevent entering either the bladder or the rectum. Following this dissection the vagina is kept patent by means of glass pessaries or by packing with iodoform gauze, the packing being removed and replaced each day. The patient should be observed for a period of six months to a year in order to prevent reformation of the atresia, and as soon as further closure is in the least evident further dilatation should be instituted.

Inasmuch as the patient continues to menstruate, the blood that is passed is held back by the atresia and in the course of time fills and

dilates the vagina, the uterus, and the tubes. If this has taken place, the syrup like tarry blood is evacuated before packing the vagina. If this condition is allowed to exist over a long period of time, eventually, by pressure distention and proteolysis, the endometrium and uterine musculature as well as the endosalpinx and the surrounding musculature are destroyed leaving thin-walled sacs which are mainly made up of visceral peritoneum. In a patient who has had her pelvic organs filled with blood over a long period of time further studies should be made with lipiodol injection, and if nothing but thin sacs are found to remain, these should be removed.

CASE REPORT

Mrs. McB., seventeen years old, was admitted to the gynecologic service at Cook County Hospital on September 30, 1929. Her chief complaints were pain in the lower abdomen, dysuria, urinary frequency and urgency, backache, and amenorrhea. She had been delivered of a full-term child on June 15, 1929, the labor having been terminated by the use of forceps without any anesthetic and with no subsequent repair. The baby died soon after birth. The puerperium was apparently without any sort of complication, the patient passing lochia for three days and having no further vaginal discharge of any kind.

About one month after delivery the patient began to sense pain in the lower abdomen. This pain became increasingly worse with rather acute exacerbations at monthly intervals. The urinary difficulties complained of had become more and more annoying until the time of admission to the hospital. There had been no passage of blood from the vagina during all this time.

General physical examination was negative as were the laboratory findings. There was a slight distention of the lower abdomen, tenderness over the lower middle quadrant, and a sense of resistance in the lower left quadrant suggestive of a mass in that region. Bimanual examination revealed a multiparous introitus. The vagina was patent for only about one inch and no passage could be found on either side. Rectal examination disclosed a large, soft, boggy mass filling the vagina from side to side and making palpation of the internal genitals impossible.

Pneumoperitoneum showed the uterus and the left tube to be greatly enlarged.

Under gas anesthesia attempts to separate the adhering walls of the vagina were at once successful. The atresia was found to have taken place between the anterior and posterior vaginal walls at about the level of the entrance of the urethra into the bladder. A large amount of tarry blood issued from the vagina as soon as the adherent walls were separated. Further examination revealed an only moderately enlarged uterus with barely palpable adnexa. The vagina was tightly packed with iodoform gauze.

The packing was removed and the cavity was repacked at two-day intervals for a period of two weeks. On leaving the hospital the vagina was patent and pelvic palpation revealed no abnormal findings.

The patient was seen about one month after operation and she reported that menstruation was normal and coitus had been performed without difficulty. The vagina was patent and easily admitted two fingers.

310 SOUTH MICHIGAN AVENUE.

A CASE OF ABDOMINAL PREGNANCY, WITH THE DIAGNOSIS CONFIRMED BY UTEROGRAM

BY GEORGE R. OSBORN, M.D., F.A.C.S., TULSA, OKLA.

OWING to the infrequency of abdominal pregnancy and to the variations in symptoms and physical findings, it is not always easy to make a positive preoperative diagnosis.

In a suspected case, with a live fetus, one might justly hesitate to pass a sound through the cervix, even if gestation had progressed to the stage of viability. For a pregnancy may progress without noticeably unusual symptoms to near term and the fetus die, but the patient, not convinced that it is dead, will not submit to probing the uterus nor to any operative procedure. Such a patient is willing to wait and let time determine whether her baby is alive. Providing there is no separation of placenta, infection nor other complications develop, she may come to no harm by waiting. In fact, if one could be sure that no complications would develop, it might be advisable to wait until the placental blood vessels had become obliterated or atrophied, as it would simplify the removal of the placenta.

In view of the high mortality attending the removal of an abdominal pregnancy any time after the middle of the gestation period, whether the fetus be living or dead, an early positive diagnosis is important.

A uterogram makes a positive diagnosis possible at any stage and is a safe and simple procedure.

In the case with which this report deals, the patient had not consulted her physician regularly for prenatal care because she was a Christian Scientist. However, when she passed the estimated time for her confinement, she became greatly concerned as she was very desirous of having a child and, while she was respectful of her physician's ability, she was loath to accept his diagnosis of a dead fetus. It was to add the weight of another's opinion that she was sent to me.

Mrs. F. W., white, primipara, aged twenty-six, married eight years and has had no miscarriages. First seen and examined December 11, 1928. Her general health was good; she never had any serious illness, menstruation was normal. Last menstruation preceding pregnancy, December 16, 1927. "Spotting" in January. History of pregnancy otherwise uneventful until August 28, when she had some disturbance and death of the fetus was diagnosed by Dr. Stambro. She menstruated September 23 to 26; October 27 to 30; November 29 to December 1. These periods were normal and had none of the characteristics of hemorrhages or show, although they were believed, by the patient, to be the signal show, characteristic of the onset of labor. She had no pains, however, at any time. The physical examination shows her to be well nourished, though of slight build, with no edema, no gaseous distension of the abdomen. Skin was clear, and there was no coating of tongue. Temperature 99° F.; blood pressure 120/80. Abdominal examination showed a hard mass of the consistency of a fibroid, quite regular and like in shape to a pregnant

uterus of about seven months' gestation with one cornu (the left) extending higher than the other. (According to her history the abdomen had been larger.) No fetal heart sounds or movements. Vaginal examination showed normal vaginal mucous membrane; no laxity of walls as in pregnancy at or near term. Cervix small nulliparous type; firm and closed. Posterior to cervix, fetal head could be felt but could be moved very little. Anterior to head might be felt what appears to be an elongated fundus extending slightly to the right.

From the examination and a history of three menstrual periods since the estimated end of term, a diagnosis of abdominal pregnancy with death of the fetus was made and while the patient had brought with her an x-ray picture taken by Dr.

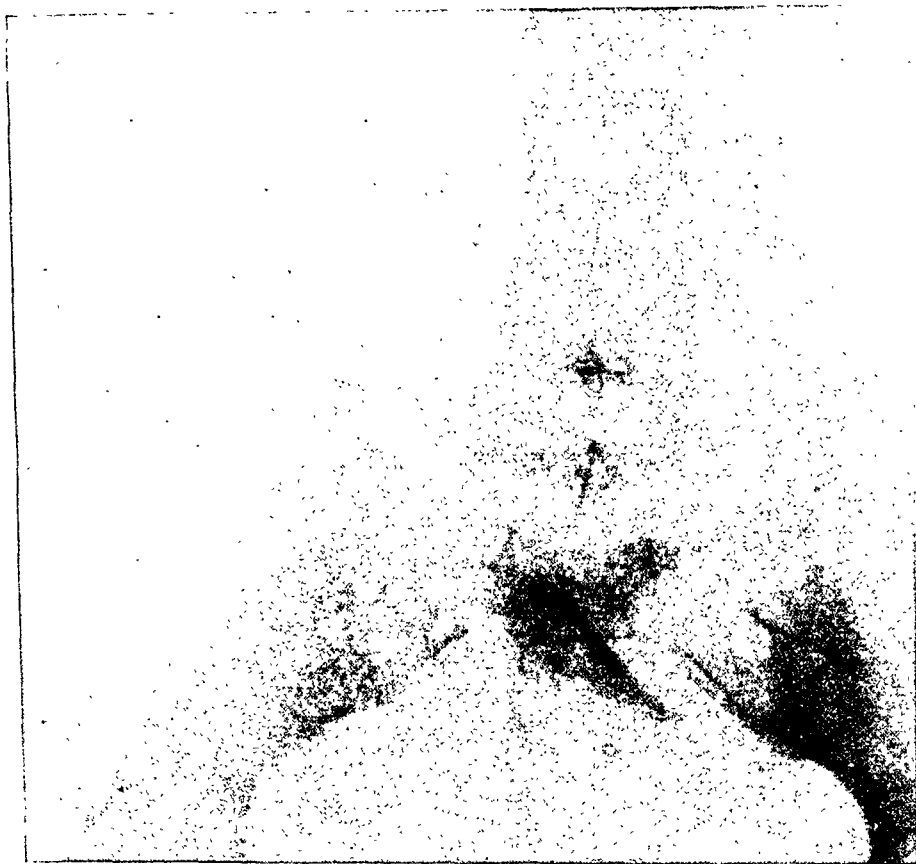


Fig. 1.—Showing fetus on right side with the head over brim of pelvis. Nothing in this picture to indicate extrauterine pregnancy.

Stambro, her physician, which showed the fetus plainly, a request was made for another picture with a lipiodol injection of the uterus. She submitted to having another x-ray picture made but refused the lipiodol injection because she still thought she felt the movement of the fetus.

The second skiagram (Fig. 1) showed nothing different from the first and she returned to her home.

Two weeks later she returned to my office with Dr. Stambro, who had induced her to have the uterogram made.

She complained of no discomfort from the lipiodol injection. Ten c.c. were injected with ease and the accompanying skiagram (Fig. 2) corroborated the diagnosis of abdominal pregnancy, and convinced the patient of her unfortunate condition, and on December 28 she was operated upon by Dr. Stambro to whom

I am indebted for the privilege of assisting and thus following to the end this interesting case.

On opening the abdomen the omentum was encountered adherent in several places over the membranes. This omentum was ligated and excised at all points of contact, revealing the placenta attached to the posterior aspect of the left broad ligament, ovarian ligament, and to the anterior surface of the sigmoid flexure of the colon. The placenta was as large as a medium sized, full-term placenta and had been pushed up out of the pelvis by the head and shoulders of the fetus which were well down in the posterior culdesac. The left tube and broad ligament were drawn taut over the anterior surface of this placental mass which extended well up above the umbilicus. This was what appeared, upon physical examination, to be the left cornu of the uterus extending higher than the right. The broad ligament, fallopian tube and ovarian ligament were clamped and cut, releasing the entire mass except a small attachment in the left culdesac and the anterior surface



Fig. 2.—Showing fetus in same position as Fig. 1, taken two weeks previously, also some changes in shape of head due to overlapping of cranial bones. To the right, and low in the pelvis, the injected uterus confirming the extrauterine pregnancy. No lipiodol showing outside the uterus, indicates closed tubes.

of the sigmoid. The attachment to the sigmoid was at the edge of the placenta and the reflection of the membranes. The obliteration of the placental circulation had reduced this attachment to a pedicle or band about two and one-half inches wide which, under traction, was easily clamped with two clamps and cut between, leaving a narrow, longitudinal strip on the bowel to be peritonealized. The small attachment in the posterior culdesac was separated easily by dissection with the gloved finger where a small amount of bleeding occurred, but was soon controlled by hot pack after removal of the placenta and fetus intact; the membranes unruptured. The left tube and ovary and a good portion of the left broad and ovarian ligaments were removed attached to the placenta. The abdomen was closed without drainage.

The uterus was not enlarged and appeared normal except for a slight roughening of the peritoneal covering on the posterior surface. The right ovary and tube were normal except for a roughening of the peritoneum of the tube. There were no adhesions or pathologic abnormalities apparent in the abdomen or pelvis, except a slight enfolding of the fimbria of the right tube. No attempt was made to determine the patency of this tube.

The fetus was a female of about thirty-five weeks' gestation. It was not macerated and probably would have become a calcified mummy.

The patient recovered rapidly and left the hospital on the eleventh day after the operation.

Acknowledgement is made to Dr. Morris Lhevine, roentgenologist, whose experience in uterosalpingography lead me to take this method of confirming the diagnosis of abdominal pregnancy in this case.

801 MEDICAL ARTS BUILDING.

CESAREAN SECTION AND SUBSEQUENT LABOR

REPORT OF CASES

BY ROY L. GROGAN, A.B., M.S., M.D., FORT WORTH, TEXAS

KNOWING full well that previous cesarean sections are a positive indication for subsequent sections under certain conditions, this communication is not presented as an argument for the general practice of allowing parturients the test of labor, who previously have undergone cesarean sections for various reasons, but merely as evidence that under ideal conditions, certain cases may be delivered by the natural passages, after having had as many as three abdominal sections. Without entering into a discussion of the merits and demerits of this elective method, the plan of procedure and report of two cases follows:

Careful prenatal observation was enforced to prevent overweight and frequent measurements of the fetuses were taken as the patients approached the end of the gestation period. X-ray determinations of the comparative size of fetus and pelvis supplemented the external measurements. No vaginal examinations were made closer than a month to the time of delivery. When the gestation period had reached about eight and one-half months, and knowing that no disproportion existed, the patients were sent to the hospital. After routine preparation for delivery, under strictest aseptic precautions, a tampon saturated with four per cent mercurochrome was put into the vagina. The delivery room was set up for both delivery and laparotomy.

After the tampon had remained one hour in the vaginal canal, the patient was prepared, draped, and under light nitrous-oxide anesthesia, a No. 4 Voorhees bag was introduced into the cervix. The patients were not moved from the delivery table, but watched closely from the onset of contractions to the termination of labor. Upon expulsion of the bag and completion of dilatation, prophylactic forceps were applied to shorten the second stage of labor.

CASE 1.—Mrs. E. W. J., aged twenty-seven, para iii. First labor, gave birth to a stillborn child in 1920. Recovery uneventful. Weight 7 pounds, cause of death undetermined.

In 1925, at about the seventh month, she began having some edema of face and limbs. Was told she would have convulsions if not delivered at once and was advised to have an abdominal section. This was done. A three and one-half pound child was delivered which was viable.

Patient became pregnant in 1926 and came on my service about five and one-half months' term. She cooperated thoroughly, not only did she not gain weight but lost five pounds during the remaining months and was delivered normally Nov. 24, 1926, of a normal seven pound female child, the above method being used. Recovery was without morbidity. The patient is now again pregnant and barring complications, will be delivered by the same method.

CASE 2.—Mrs. C. D. F., aged thirty-four, white, married 14 years, para iv. Had three abdominal sections, one laparotomy for adhesions, one application of radium for metrorrhagia and menorrhagia (900 mg. hours.), and tonsillectomy.

Menstruation active at twelve and of twenty-eight-day type, three to five day flow, free amount, marked dysmenorrhea. Three children, one stillborn, weights at birth 12, 8, 7½ pounds. Two children living and well. First labor: Prenatal period uneventful. Twenty-four hours of labor with fundic type section. Puerperium stormy. Second labor: Allowed test of labor. The labor was approximately twelve hours duration followed by fundic type section. Puerperium stormy, puerperal sepsis, slow recovery. Third labor: Elective cesarean section at term. Fundic type with normal puerperium.

Present history.—Due to radium application, patient had not menstruated for nearly two years, was nauseated and vomited considerably during months of May and June and had persistent headaches. Weight when first observed 124 pounds, blood pressure 108/60, urine negative.

Physical examination.—Unimportant, except midline scar extending from pubis to 8 cm. above umbilicus. Uterus, size of grapefruit, fixed by adhesions over fundus and tender. Pelvic measurements: Sp. 25, Cr. 27, Tr. 31, Bd. 20, C.d. 11½, C.v. 11. January 5, patient weighed 138 pounds, blood pressure 116/74, urine negative. Uterus midway between umbilicus and xiphoid process. Massive intestinal adhesions over fundus of uterus. Cervix soft and easily dilatable. X-ray examination revealed cephalic presentation of fetus, head engaged. Estimated weight 6 pounds 4 ounces. Patient was sent to hospital for induction of labor.

A No. 4 Voorhees bag was introduced at 1:00 P.M., expelled two hours later. Rectal examination at that time revealed cervix effaced, 6 to 8 cm. dilatation, presentation R.O.P. Under nitrous-oxide and oxygen, patient was allowed to have pains for about forty minutes, which were irregular but markedly strong. At the end of forty minutes, after expulsion of the bag, complete dilatation was found. After rotation from the posterior position, a delivery by modified Scanzoni of a normal, female child was accomplished, weight 5 lb., 14 oz. No hemorrhage and only first degree lacerations of perineum were noted. Recovery was without morbidity. At present mother and child are doing well.

CONCLUSION

It is apparent from the above cases that a normal delivery under ideal conditions can be accomplished after as many as three cesarean sections.

A note of warning must be sounded that precautions must be taken in order to be able to take care of any threatened rupture which may arise during process of labor.

905 MEDICAL ARTS BUILDING.

PAPILLOMA OF THE ENDOMETRIUM*

BY W. A. DAFOE, M.D., TORONTO, ONT.

(Fellow in Obstetrics and Gynecology, University of Toronto)

THIS case which I am reporting, is of interest from a pathologic, as well as a clinical standpoint.

Mrs. R., aged fifty-nine, para ii, menopause at fifty. Had a pernicious anemia twenty years previously, otherwise well.

Present Complaint: Slight vaginal bleeding at irregular intervals for six months. No pain. No history of discharge.

Examination: No bleeding from cervical canal. Cervix showed slight area of erosion. Uterus was normal in position and size and was freely movable. Fornices were clear. There was some eversion of the anterior and posterior vaginal walls.

Diagnosis: On account of the patient's age and history, a carcinoma of the uterine body was suspected and a curettage was advised. This was done two weeks later.

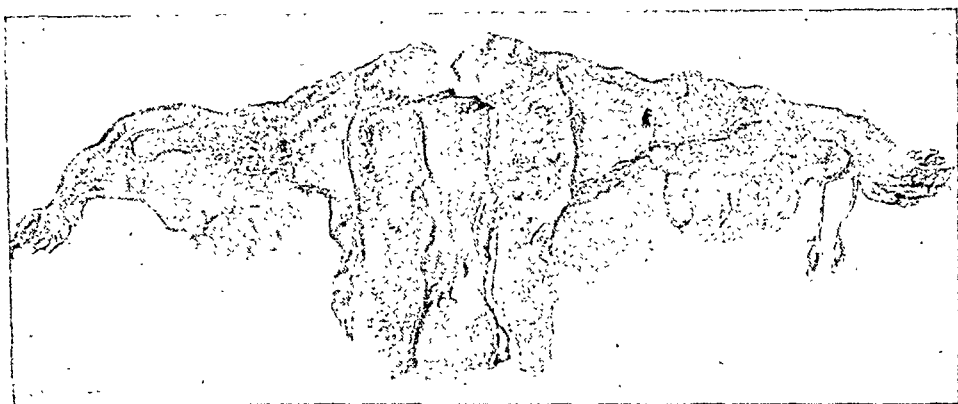


Fig. 1.—The papilloma may be seen at the upper portion of the endometrial cavity. Close to this is a small submucous fibroid.

The curettings were moderate in amount, rather thick, somewhat friable, and suggested malignancy. A microscopic examination showed a papillomatous growth made up of numerous branching finger-like processes. Each process consisted of a central core made up of a loose mesothelial structure and covered by a single layer of low cuboidal epithelium. These epithelial cells were small, contracted and set upon a basement membrane. In some areas, the central cores of the projecting processes had undergone a hyaline degeneration and in other areas the mesothelium was infiltrated with blood cells. The latter findings gave those portions the appearance of degenerating chorionic villi. Glands, or gland-like structures were entirely absent from the section. There were no signs of malignancy, and the pathologic diagnosis read papilloma of the endometrium.

About one month later, a complete hysterectomy was done. On examination of the specimen, the tubes and ovaries were found to be normal. The uterus was normal except for a small subperitoneal fibroid on the left side. The uterine cavity showed a small area about $\frac{1}{2}$ inch in diameter, on the upper portion, made up of

*Read at the Academy of Medicine, Toronto, October 22, 1929.

a glistening collection of rounded elevations, at the outer edge of which there was a small submucous fibroid.

I have only been able to find two other cases of similar nature reported in medical literature: one by Haultain in 1913; a patient aged fifty-nine, who gave a history of vaginal bleeding at four to six weeks' intervals ever since she was forty-seven years of age. Her menopause occurred at forty-five. A curettage was done but six weeks later the symptoms recurred and a hysterectomy was done. The other reference was to a case of Bland Sutton's who removed the uterus in a woman aged eighty-three. The microscopic findings in both of these cases were exactly similar to those described in this report.

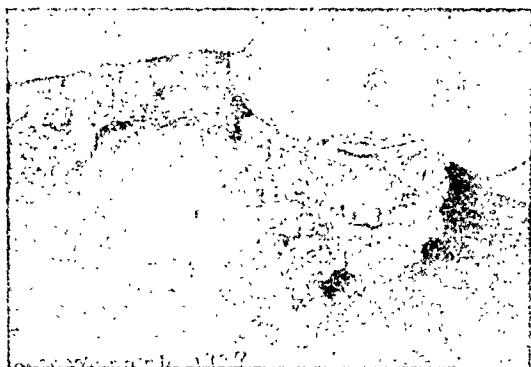


Fig. 2.—An enlarged drawing of the papilloma showing the glistening collection of rounded elevations.

CONCLUSION

Growths, apart from pregnancy, arising from the endometrium are practically always made up of glandular elements with a small amount of stroma as a supporting structure, but in the papilloma we have a warty growth with a fibrous connective tissue core covered by a single layer of low cubical epithelium. This is apparently innocent in nature. In the case quoted by Haultain the symptoms were present for twelve years. However, in each of the three cases, a hysterectomy was done because of the possibility of these growths becoming malignant, and also because of the unsatisfactory results which sometimes follow curettage.

I wish to thank Dr. Gordon Gallie for his permission to report the above case.

THE METHOD OF IDENTIFYING NEWBORN INFANTS AT THE BOSTON LYING-IN HOSPITAL

BY FREDERICK C. IRVING, M.D., F.A.C.S., BOSTON, MASS.

A METHOD for identifying newborn infants in a hospital should be reliable, simple, and reassuring to the mother of each baby. The device used should be indestructible and inexpensive. In some institutions cardboard or celluloid tags are attached to the babies; in others tapes marked with indelible ink are sewed about the wrists and ankles. As the result of the frequent washings and oilings given to newborn infants such means of identification often become illegible

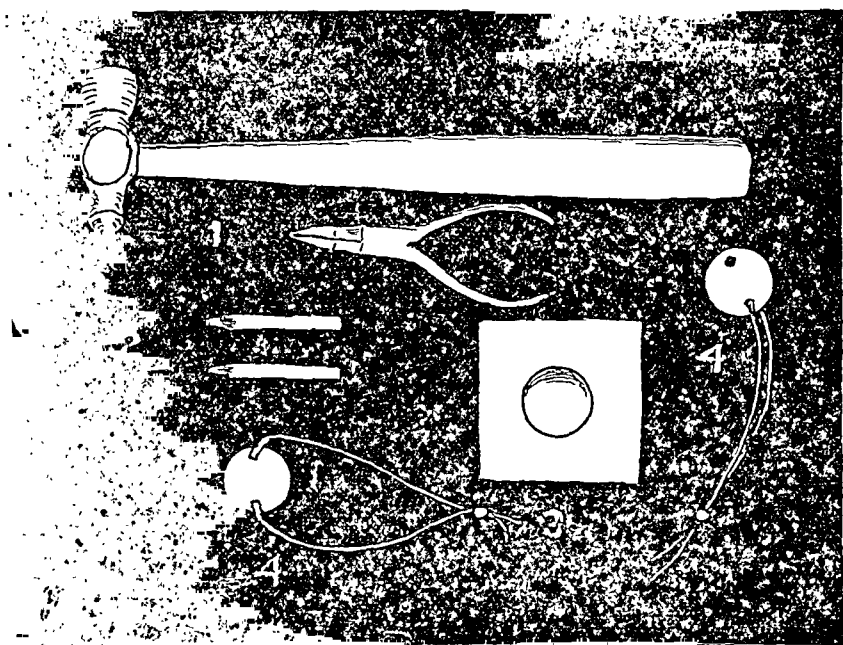


Fig. 1.—Outfit for marking babies. 1, Pliers for crushing perforated shot. 2, Two of a set of dies for stamping names on disks. 3, Anvil with countersunk area in which disks are placed for marking. 4, Identification disks.

and must be replaced. Tapes have a tendency to roll themselves into cords which require unfurling before the name of the baby can be deciphered. The name in the bead necklace is easily read but should another infant of the same surname be born the necklace of the first child must be removed, partially unstrung, one or more identifying initials added, the restringing completed and the necklace reapplied. After the baby is discharged, the necklace must be disassembled and each component letter placed in the proper compartment of the box.

There seems to be much lay faith in the efficacy of footprints in the identification of newborn babies. It should be evident, however, that

no nurse can select the proper baby from a nursery and take it to its own mother's breast simply by looking at the soles of its feet. All hospitals that use the footprint method must employ other means of identification, such as the tag, tape or necklace. For practical purposes the taking of footprints merely adds an unnecessary maneuver. Footprints and finger prints, to be of value, must be taken by a person skilled in this procedure. The average nurse has no such special ability. Not a few of the impressions taken by the delivery room staff are unintelligible blots. The classification of these friction ridge impressions is a science in itself.

With these facts in mind we have instituted the use of the army aluminum identification disks at the Boston Lying-In Hospital. As the disks come from the manufacturer, they have two holes punched in them and are stamped in pairs with serial numbers. At the time of delivery the mother's surname is cut on the back of each one of a given pair bearing on the other side the same serial number. When

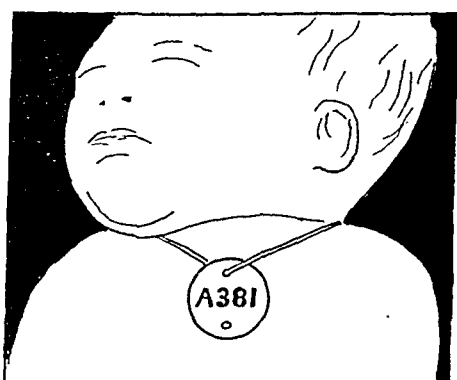
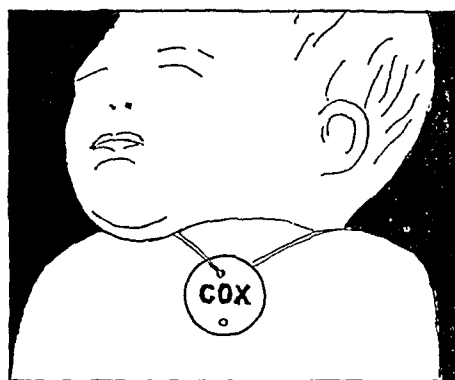


Fig. 2.—Disk applied to neck of infant. Name side out. Fig. 3.—Disk applied to neck of infant. Number side out.

the baby is born, one of the tags is affixed to the infant and the other to the mother. Should there be more than one mother of the same surname in the hospital, this situation is taken care of by the serial numbers. For instance, there may be "Jones, A 1094," "Jones, A 1101" and even "Jones, A 1105." The tags are inexpensive, indestructible, and always legible, as the names and numbers are cut into their surfaces with dies. Any time the baby is brought to breast the mother may reassure herself that she has the right infant by comparing the serial number of her own tag with that of the baby. A method of identification is provided which is simple and positive.

The operation of the method is explained by the following rules, which are posted in every case room:

1. When each patient is approaching delivery two metal tags, bearing the same number, are to be prepared by the nurse in charge of the delivery floor as follows:
 - a. Each tag is placed face down on the anvil and marked with the patient's last name.

b. A piece of waxed fish line one foot long is threaded through one hole of one tag and both holes of the other tag.

c. The two ends of the fish lines on each tag are passed in the same direction through the hole in a perforated shot, and the shot is slipped down as near the tag as possible. The two ends of each piece of fish line are then knotted.

d. The two tags are sterilized with the delivery kit.

2. After the cord is tied and cut, the staff member, resident, house officer, extern, nurse or other person delivering the baby will select the tag which has been threaded through one hole. He will slip the shot away from the tag, thus

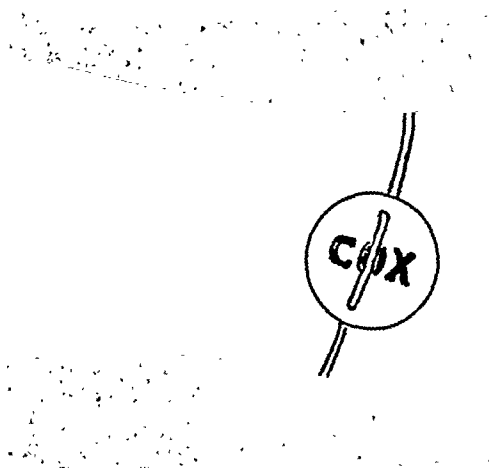


Fig. 4.—Disk applied to left wrist of mother. Name side out.

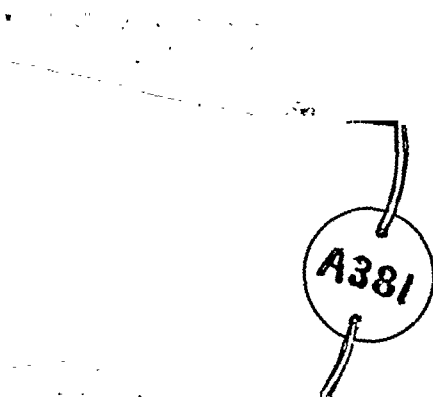


Fig. 5.—Disk applied to left wrist of mother. Number side out.

forming a loop. This loop is placed over the baby's head and the shot moved back, thus reducing the loop to such a size that it cannot be slipped over the head. Enough slack should be allowed to permit the insertion of three fingers between the loop and the baby's neck. The shot is then crushed with a pair of pliers.

3. Before the person delivering the baby leaves the room, he will place the loop of the other tag over the mother's left wrist and adjust it to such a size that it cannot be slipped over her hand. He will then crush the shot with the pliers.

4. Before the person delivering the baby leaves the room, he will see that the nurse in charge of the case has entered at the top of the delivery sheet the same serial number that is on the two tags. He will also see that the name on the chart corresponds to that on the tags affixed to both mother and baby.

5. Should delivery occur so rapidly that there has been no opportunity to prepare tags, the tags are to be marked and sterilized during the delivery. No exception is to be made to this rule.

6. Tags are not to be removed from either mother or baby during their stay in the hospital.

7. At the time the mother and baby are discharged both tags are to be removed at the front door, and the numbers and names compared in the presence of the mother. The tags are then tied together and are kept for one year, at the end of which time they are to be thrown away.

8. Should a baby remain in the hospital after the discharge of its mother, its tag is not to be removed. In such a case the mother's tag is to be attached to the baby also until the infant is discharged.

9. In case of multiple pregnancy (twins or triplets) a tag is applied to the mother's wrist for each baby. The first baby born receives the lower serial number, the second the next higher, and so on.

10. All stillborn, macerated or nonviable fetuses are to be marked in this way.

11. The above rules also apply to all private patients delivered in the hospital.

221 LONGWOOD AVENUE.

A STETHOSCOPE FOR AUSCULTATING THE FETAL HEART*

BY MORRIS LEFF, M.D., NEW YORK, N. Y.

THE stethoscopes used for auscultating the fetal heart have been the same as those used for the chest. The physical contour of the abdomen should require a different type of instrument. The use of the ear directly is an uncomfortable and unesthetic procedure which should be reserved for exceptional occasions.

The stethoscope presented in Fig. 1 has some features which make it especially suitable. It consists of two parts (Fig. 1): *A* is analogous to the chestpiece, and *B* resembles the usual binaurals. Part *A*, or the bell, consists of a metal weight three inches in diameter and weighs two pounds. Its undersurface has a concavity, at the apex of which is an opening, which is continuous with the handle or stem of the instrument. This handle is hollow and is connected with an adaptor to the binaurals *B*.

The advantages of this stethoscope† are as follows:

1. The weight of the instrument is sufficient to keep it in place on the abdomen, without the need of extra pressure.

2. As no outside pressure is necessary, it eliminates the friction sounds which are produced by the fingers or rubber bands.

*Presented before the Section of Obstetrics and Gynecology of the New York Academy of Medicine, October 22, 1929.

†Manufactured by Geo. Tieman and Co., 107 East 28th St., New York.

3. Its greater surface and the fact that it can be moved from one spot on the abdomen to another quickly, facilitate the localization of the sounds.

4. There is no strain produced when listening to the sounds for any length of time.

5. On account of its larger surface its weight is distributed over a bigger area, and it thereby disturbs the patient less than the pressure of the ordinary stethoscope.

6. The fetal heart sounds can be heard while there are noises in the room.

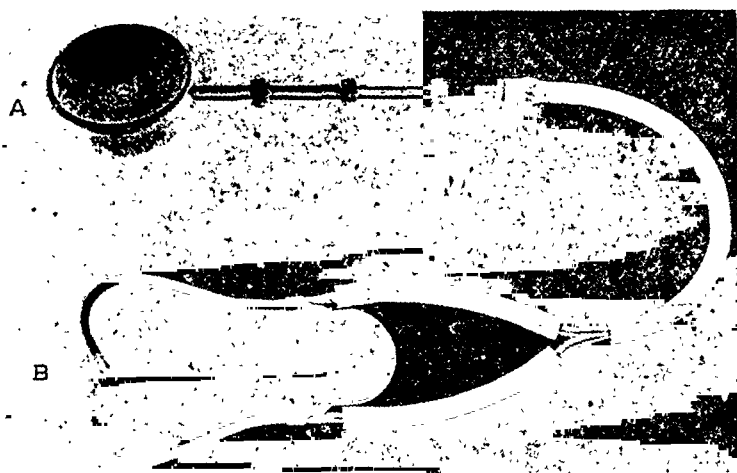


Fig. 1.—Fetal heart stethoscope; A, bell; B, binaurals.

7. The hands are left free, either to hold a watch, to compare the fetal and maternal pulse, or for any other purpose.

8. It can be placed under the sterile sheet on the abdomen during a delivery, and the nurse can watch the fetal heart sounds at all times.

9. It is also useful when doing a Rubin test. The operator himself can listen to the sound of the air passing through the tubes, while it leaves his hands free to do the test.

Both doctors and nurses who have used this stethoscope find it preferable to the ordinary type.

15 EAST ONE HUNDRED ELEVENTH STREET.

Society Transactions

NEW YORK OBSTETRICAL SOCIETY

MEETING OF FEBRUARY 11, 1930

DR. H. C. WILLIAMSON presented a report of a case of **Placenta Accreta with Hysterectomy**.

The term placenta accreta implies the development of the placenta with little or no decidua basalis. The villi, therefore, are in direct contact with the uterine musculature. The placenta has become so firmly attached to the uterus that it cannot be normally separated by the mechanism of the third stage of labor, nor can it be completely removed manually from the uterine wall as there is no line of cleavage.

Mrs. M. M., white, twenty-eight years of age, para v, applied to the Manhattan Maternity and Dispensary June 11, 1929.

Menstruation began at fourteen years, was irregular, and there was marked dysmenorrhea until after her marriage at seventeen years of age, when the periods became more regular and less painful.

During her first pregnancy there was intermittent bleeding for four months and a premature delivery occurred at the twenty-eighth week. A living child was born but died in a few minutes. The placenta was retained and had to be manually removed. The puerperium was normal.

The second pregnancy and labor, lasting twelve hours, was normal. The placenta was again manually removed; this time a profuse hemorrhage occurred. These two deliveries took place at her home in Ireland.

In the third pregnancy and labor she was attended by the out-patient service of a New York hospital. The labor was short and the placenta again removed manually with profuse hemorrhage. The uterus was packed immediately and the packing removed forty-eight hours later. She states that the puerperium was febrile, and it was necessary to remain in bed for three weeks.

During her fourth pregnancy she was under the care of the Manhattan Maternity and Dispensary and had a moderately difficult ten-hour labor at home. The baby presented by the breech and weighed nine and a half pounds. The placenta was again retained, manually removed and the uterus packed for hemorrhage. The uterine packing was removed in twenty-four hours. During the first four days postpartum the temperature varied from 99° to 102° F.; during the remainder of the puerperium, it was normal. There was a moderately profuse, foul smelling lochia during the puerperium.

Present Pregnancy.—The prenatal period was normal. The Wassermann reaction was negative. She was admitted to the hospital September 1, 1929, in active labor. The delivery was spontaneous, the total duration of labor twelve hours. For one and a half hours thereafter no bleeding occurred but the placenta could not be expressed. One cubic centimeter of pituitary extract was then given and an attempt made to express the placenta by the Credé method. This maneuver resulted in profuse bleeding. An attempt was then made to remove the placenta manually. The operator estimated that he had removed about one-third of the placenta when he was forced to stop on account of profuse bleeding. The uterine cavity was tightly packed. The patient was in marked shock, with a systolic blood pressure of 45 and a pulse rate of 200. Appropriate measures were instituted and as soon as possible a transfusion of 800 c.c. of blood was given.

On September 3, 1929, her general condition had improved. The blood pressure was 124/72 and the red blood count 3,800,000 with 70 per cent Hb. It was thought advisable to give a second transfusion of 500 c.c. of blood before attempting an operation.

Operation.—The packing was removed and the uterine cavity carefully explored. It felt as though a large amount of placenta was firmly adherent to the uterine wall. A supravaginal hysterectomy was then quickly performed. The uterus presented an unusually ischemic appearance, and there were a few petechial hemor-



Fig. 1.

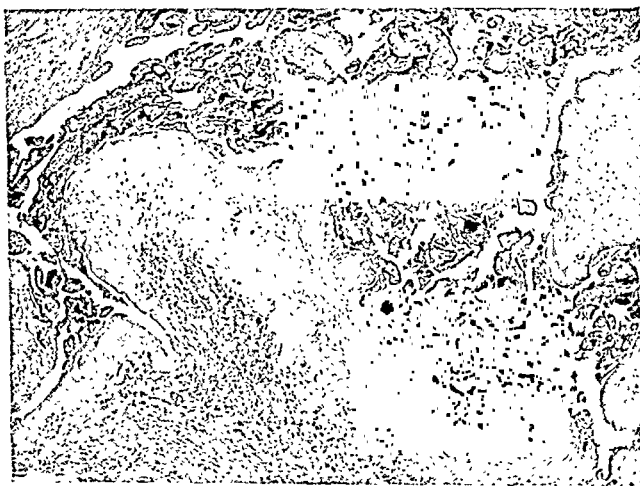


Fig. 2.

rhages on the anterior surface. The postoperative course was uneventful. The highest temperature was 102.4° F. on the second day. It became normal on the third day and remained so thereafter. She was discharged on the fifteenth day. At the follow-up clinic, six weeks later, she was found to be perfectly well.

The specimen was submitted to two pathologists, Doctors Alexander Fraser and James Ewing. Their reports are quoted.

Doctor Fraser.—Sections from the "adherent" patches show no decidua or spongy endometrium. The musculature is riddled with large venous sinuses, making a "spongy layer." In many of these caverns the villi are present and

in places attached. Some are empty and others contain pus. The muscle surrounding them often shows piling up of new muscle nuclei representing regenerating muscle fibers. The outer layer of villi is imbedded in a poorly staining hyaline homogeneous substance containing kariorrhetic pus cells representing probably necrotic "endometrial decidua." I interpret this as necrosis of "endometrial" decidua and formation of a "spongy layer" from the muscle.

Diagnosis.—Placenta Accrета.

Dr. Ewing. The main pathologic features in the sections of the uterine wall are:

1. Practically complete absence of decidual reaction. There are very few isolated foci about 1 mm. in diameter in which there are traces of atrophic decidual cells, but these foci are very scanty.
2. The well-developed fetal villi penetrate deeply into the sinuses.
3. The muscular wall of the uterus ends abruptly in a zone of hyaline tissue in which the villi are embedded or tightly adherent. At these points there is no trace of decidual tissue.
4. There are several strata between villi and musculature which show polynuclear leucocytic infiltration, indicating the presence of some chronic infection.
5. Throughout the deeper musculature there is a moderate invasion by isolated syncytial wandering cells, which is probably normal.

DISCUSSION

DR. ELIOT BISHOP.—The differential diagnosis of this condition from adherent placenta, so called, or partially-separated placenta is that with placenta accreta there should never be any bleeding. In this the speaker seems to contradict himself, as he reports severe bleeding, even though it occurred some time after delivery. Perhaps there may have been a condition of partial accreta.

With his treatment we all must agree, radical as it is, the placenta may be removed only with the uterus, as, to all practical purposes, it is one with it.

I do want to discuss the etiology, however, and to bring a practical point to bear in the prophylaxis, even though many of us will never meet this condition. Dr. Williamson and others feel that a foregoing endometritis is as likely to be a factor as anything. Endometritis has been debated by gynecologic pathologists during the last decade or two, many feeling that it never occurs in the chronic state, only in the acute septic state after childbirth or abortion. The obvious cause of it is invasion of the endometrium with bacteria. This patient had had packing of the endometrium at previous labors to control hemorrhage, which is an accepted procedure. We must all admit that it may be the most perfect medium for introducing bacteria. Technic in the presence of hemorrhage may be more hurried than aseptic, and the gauze has to be carried over the lower birth-canal before it gets into the uterus.

When Dr. William Sidney Smith read his paper before this Society in November, 1925, entitled "Obstetric Heresies at the Brooklyn Hospital," he referred to the methods there used of controlling bleeding postpartum. As soon as bleeding started, the method brought out by Dickinson many years ago of holding the fundus high in the abdomen, to kink the uterine arteries and compressing it between both hands to shut down on the sinuses, in almost all instances was found to control bleeding. If bleeding would ensue on relaxing this maneuver and packing to replace the hands was necessary, the vagina and *never* the uterus was packed. Tight packing of the vagina will kink the uterine arteries and the fundus can be compressed above it. Packing the cavity of the uterus was felt to nullify its efforts, as the sinuses would be kept open and the uterus could relax on the soggy pack. Not only was it felt that better hemostasis was obtained by the other method, but the uterine cavity was not invaded. In addition, with the greater

security of this method, packs were removed and the ordinary vaginal drainage was reestablished no later than twelve hours. At the risk of being dogmatic, the rule of the service is that *no uterus* is to be packed postpartum, and no packs are to remain more than *twelve* hours.

Rare as it is, may we not reduce the chance of acute endometritis postpartum, which in this patient may have been the cause of her placenta accreta, if we will leave the uterine cavity alone, when possible?

DR. E. C. LYON, JR.—Recently I encountered a case apparently of placenta accreta but as yet the report of the pathologist has not been received. If it should prove to be such a case I shall report it later.

The patient was a primipara who came into the hospital through the prenatal clinic and was delivered without any special difficulty after a normal labor. The placenta seemed to be complete. After the delivery the uterus did not contract particularly well, and she was given an added dose of pituitary and of an ergot preparation. Three hours later they reported that the patient was bleeding and had lost about 500 c.c. of blood. We were able to transfuse her and the bleeding ceased. Shortly afterward, however, I received a telephone message that the patient was again bleeding. When I saw her this time she was in marked shock. I felt that hysterectomy would do more for her at this time than any vaginal manipulation. A supravaginal hysterectomy was done.

The interesting point is that the membranes were retained and adherent over quite a section of the uterus. Apparently the part that was retained was a succenturiate lobe about 3 cm. across. It was very firmly adherent to the uterus and the pathologist is of the opinion this succenturiate lobe may be an accreta. The patient had two transfusions of 1000 c.c. in all, and made a satisfactory convalescence.

DR. H. C. WILLIAMSON.—I would like to correct Dr. Bishop. This patient did not bleed for an hour and a half after delivery, and it was only after the one cubic centimeter of pituitary extract and a very forcible Credé maneuver was attempted, when probably part of the placenta was torn loose, that hemorrhage occurred. Then they attempted to remove the placenta manually and tore out part of it, causing profuse hemorrhage and shock. Her first two deliveries were at home in Ireland and, as far as could be ascertained, she was not packed at that time. In New York we do pack the uterus for hemorrhage. We see very few cases of placenta accreta and I do not believe that the intrauterine pack is much of a causative factor in placenta accreta. This patient, of course, had histologic evidence of chronic endometritis with infiltration of polynuclear cells in the endometrium.

DR. H. D. FURNISS presented a paper on *Trichomonas Vaginalis*. (For original article see page 93.)

DISCUSSION

DR. W. H. CARY.—I have had the opportunity of studying thirteen cases in my practice during recent months. The youngest patient was eighteen years of age and obviously a virgin; the oldest was aged fifty-three and had sustained a surgical menopause nine years ago. In the latter case sexual continence had been maintained for two years and the history of infection was of one year's duration. In these two cases sexual intercourse could be ruled out as an etiologic factor. Not one of my patients had children. In one case the trichomona symptoms began during the week subsequent to miscarriage. In two instances this organism was found as the cause of acute vaginitis in the later months of gestation. In one case the symptoms were entirely relieved subsequent to delivery and the other patient passed from observation.

In several of my patients saline washings were taken from the finger tips, from the folds about the prepuce and anus, and from the urethra, with negative findings, although the organism was actually present in the vagina. The handling of house pets and irregular sexual habits were investigated without helpful significance. Mucus was sucked from the cervix and examined microscopically routinely without the organism being found in a single instance. I doubted that the alkalinity of the cervical secretion was a prophylactic factor, for the living *Trichomonas* had been observed in two semen specimens removed from the vagina, where the alkalinity of the pool was marked. The activity of the spermatozoa did not seem to be adversely affected.

It was noted that these patients were comfortable during menstruation, the acute symptoms relapsing shortly after the conclusion of the period. In two or three cases, the trichomona was found shortly after menstruation and subsequently disappeared. From the history obtained I believe that transient infection by the trichomona occurred postmenstrual with considerable frequency. Almost without exception my patients gave a history of a nonirritating leucorrhea for some time before the onset of acute symptoms typical of trichomona. From these observations I am led to conclude that possibly all women are subject to infection from this organism and that a local or constitutional condition accounts for the acute and persistent invasion.

My results in the treatment of *Trichomonas vaginitis* did not make me as sanguine as Dr. Furniss. Patients had not been hospitalized but the three vigorous treatments carried out on alternate days with green soap scrub, bichloride irrigation, etc., as described by several writers, have been followed by relapse of the infection several weeks later. The discomfort sustained by patients as well as the indifferent results obtained caused me to abandon this treatment. I now treat my patients in the knee-chest position, the folds of the vagina being thereby smoothed out. The vagina is carefully cleansed and dried and a 2 per cent solution of silver nitrate is then copiously applied to all parts of the vagina and external genitals. Air is used to dry this solution and a tampon is then applied to separate the walls of the vagina. This treatment gives immediate relief from discharge and itching. For follow-up treatment lysol or bichloride douches have seemed the most effective. Almost any antiseptic seems to destroy these organisms but the penetration into the tissues may be requisite.

DR. A. M. JUDD.—I have had one case under treatment for over a year and have succeeded in getting her cleared up, only to have her return with an apparent reinfection. I never have been able to isolate the organism from the vaginal discharge, but have isolated it in the catheterized specimen of urine.

DR. F. C. HOLDEN.—During the past year we have had 83 cases in our office. When one considers that one woman had been treated seven days a week for a year for gonorrhea, that at least five had been operated upon vaginally and predominantly for the cure of this condition, and that the disease was described in 1834, and that many different men with whom I have talked about this, since my interest was stimulated in the subject, knew nothing about it, and that as experienced an observer as Dr. Robert L. Dickinson, when I showed him a clinical case in the office, said, "I have seen this condition clinically for years, but have never known the cause of it," and then we showed him the hanging drop specimen, it is perfectly astounding. Many of these women suffer extreme mental agony, they have a discharge, dyspareunia is terrific, many operations have been suggested and yet the actual cause has gone unattended.

In this series of 83 cases, 50 had previously seen other physicians for other conditions. Two of them had been told that they had carcinoma of the cervix and biopsy specimens were taken. Six were told they had gonorrhea; of course, gonorrhea may also be present.

In 89 per cent of the cases leucorrhea was the chief complaint. In 9 per cent leucorrhea was only a secondary complaint. Two had mild vaginitis and no other subjective symptoms. Fourteen were postmenopausal. Seventeen occurred in virgins. The ages of the patients ranged from sixteen to sixty-five years. The condition has been found during the course of gonorrhea just as during pregnancy.

We have tried every treatment that has been talked about. The organisms are killed in antiseptics. Saline will kill them; at least you cannot find them if the patient has had a saline douche, and under the circumstances you cannot get a hanging drop. The best time to get the drop is after the menstrual period, if the patient has had no treatment. We had one case recur after seven months of apparent cure.

In respect to the question of treatment: in the married woman who has had babies you cannot do a one finger examination where she has a bloody vaginal discharge. I recall one case which was sent to me by a New York urologist this year. She had had an abdominal-vaginal operation upstate. He said, "She now has a bloody vaginal discharge and I fear she has a recurrence of carcinoma." In that instance the acute symptoms cleared up in two weeks. She had a very active case of *Trichomonas vaginitis*. Our method of treatment is as follows: We tip the table—in the acute case you cannot wash out the vagina with green soap as it is too irritating—dry the vagina, instill some mercurochrome and put in a small wool tampon, which we cover, using a tongue depressor, with Lassar's paste. This holds the vaginal walls apart and is kept in for two days, when the patient returns for another treatment. Usually the acute symptoms subside quickly. In treating an acute inflammatory condition of the vagina we must think of the vaginal walls as being in contact. To get those surfaces well apart and to keep them separate, drying would be ideal if it were practicable, but it is not. Lassar's paste answers the purpose of keeping the vaginal walls separate. The next time the patient comes in you can use the treatment of washing out the vagina with green soap, drying, and then bathing the vagina with full strength pyroligneous acid which we have used for years in the so-called senile vaginitis secretion which in fact may be *trichomonas*. I am sure I have cured this condition long before I knew the cause of it.

Many of these women have a rather active erosion of the cervix which has been cauterized. This erosion clears up after the cure of this ulcerative condition. In many there is an eccentric erosion distant from the canal, a horseshoe-shaped erosion, which clears up very promptly.

DR. H. D. FURNISS.—A point to be noted is that we do not always relieve the patients of the leucorrhea when we relieve them of the *Trichomonas vaginalis* infection because they sometimes have a cervical leucorrhea, and that of itself will need treatment.

DR. W. T. KENNEDY read a paper entitled **Reconstruction of the Cervical Ligaments Following Complete Hysterectomy**. (For original article see page 51.)

DISCUSSION

DR. G. G. WARD.—The fact that strikes me as of particular interest is that I presume the majority of operators do a supravaginal hysterectomy because it is much easier in the average case, and also due to the fact that we all recognize that there is a slightly increased mortality rate associated with complete hysterectomy, as well as a slightly increased morbidity rate. A number of men, however, have consistently opposed this general practice and have taken the position that where the uterus is removed, the cervix should also be removed unless there

is some contraindication. Notable among these is Herbert Spencer of London, who has particularly advocated panhysterectomy as the correct procedure. Personally, I must plead guilty of having done the easier operation in the majority of cases in the past.

In our Cancer Clinic at the Woman's Hospital we have had quite a few cases in which a supravaginal hysterectomy had been done, and later carcinoma of the cervix developed. I can recall, I think, 12 cases in the past ten years among those we have reported, which we have radiated. We feel therefore that we should pay more attention to the importance of removal of this danger zone when doing an hysterectomy if it can be done with safety to the patient. The ordinary technic for complete hysterectomy is sometimes bloody and quite difficult. Richardson of Baltimore, as you know, has advocated a technic which is very much less bloody and which leaves a better vaginal vault. Dr. Ralph Worrel of Australia, who was a guest several years ago at the meeting of the American College of Surgeons, has advocated for many years an operation which is practically, as far as I can see, the same as that of Dr. Lahey of Boston, which is simple and effective and conserves the natural support of the vaginal vault. I followed his technic in a few cases with satisfaction. After having ligated the vessels and having everything free except the cervix, an incision $\frac{1}{4}$ inch deep is made completely around the cervix, just above the uterosacral ligaments, leaving the uterosacral ligaments, the cardinal ligaments, and the uteropubic fascial plane intact. Then getting into the line of cleavage between the musculature of the cervix and the mucosa with blunt scissors, the result is that there is very little bleeding and you can quite easily peel it out, leaving a shell of musculature or collar of the cervix with the ligaments attached. In this way the vaginal portion of the cervix and the mucosa is completely removed.

In so far as Dr. Kennedy's procedure is concerned, it consists, as I understand it, in closing of the vault after saving these parts by sewing them anteroposteriorly instead of laterally, which is the usual way of doing it, and I understand from that that he gets a stronger support of the vaginal vault. While I have not done that technic, I am interested to know whether it is one which gives a better vaginal vault than the other operations. If it is not too complicated I think it will have merit, but, of course, it must be tested out by a number of operations.

DR. R. M. RAWLS.—The point that particularly appeals to me is the fact that in cases of marked rectocele with a possibility of enterocele following, by using the doctor's technic on the uterosacral ligaments, we will prevent this disagreeable result in some of our hysterectomies.

I think, also, that in the paper Dr. Kennedy did not emphasize sufficiently the applicability of this procedure to supravaginal hysterectomy. In supravaginal hysterectomy the supports of the cervix are more or less sacrificed if we have to take the uterus out at the internal os, where most of us attempt to do, or below it. If we do the operation in this way (and this is usually the procedure I follow) we disturb the pelvic diaphragm, and when we amputate the uterus from the cervix, we will find, just as when a leg is amputated, that the supports retract back from the cervix, and too often we simply bring together the cervical tissue and allow the supporting structures of the anterior and posterior wall to retract. I have previously called attention to the fact that it was necessary to go beyond the cervix and bring the tissues together over the cervical stump and incorporate them in the cervical stump. It has been my custom in complete and in supravaginal hysterectomy to be sure to close this vault that is supporting the vault of the cervix and uterus when it is in. If we disturb this and do not take the trouble to bring it back, we will find, as has been my experience in some cases of supravaginal hysterectomy, the cervix prolapsed.

DR. BYRON H. GOFF.—Dr. Kennedy has spoken of the cardinal ligaments and other portions of the pelvic fascia which normally are attached to the cervix. I should like to comment briefly on the origin of the fascia which is attached to and which supports the cervix.

The standard textbooks on anatomy and the texts on gynecology state that the fascia which surrounds and supports the pelvic viscera takes its origin from the layer of fascia that covers the superior surface of the levator ani muscle. Halbin, who has made a very exhaustive study of the pelvic fascia, disputes this teaching. He contends that there are two separate and distinct systems of fascia in the pelvis, one which surrounds and supports the pelvic organs (fascia endopelvina), and another which sheathes and attaches the voluntary muscles of the pelvis (muscle fascia). This view is supported by Tandler, and by Gallaudet, who has for many years made an extensive study of the fasciae of the body in his work at Columbia University. It has been my privilege to have witnessed a convincing demonstration of the two fascial systems in dissections by Dr. Gallaudet.

The descriptions of the fascia of the pelvis as given by the previously mentioned authorities are clear and easily understandable, while those given in the texts on anatomy and on gynecology are vague and misleading.

DR. HERMANN GRAD.—I am very much impressed with this operation and believe it gives the pelvic diaphragm a proper support. I was also very much interested in the doctor's mortality. I find that his mortality in complete hysterectomy is extremely low, 1.8 per cent. In 246 cases of my own the mortality was 1.6 per cent.

In doing a complete hysterectomy we are in the habit of associating with it a higher morbidity and higher mortality, and I think that is still true. If we are going to do complete hysterectomies our mortality will be increased. I had a case today and while I was operating I was debating in my own mind whether to do a complete hysterectomy or not, but inasmuch as the pelvic floor was pretty well fixed by an inflammatory condition I felt if I did a complete hysterectomy I probably would jeopardize the patient's chances for recovery.

In looking over one of my charts I find that in 5 cases of complete hysterectomy and in 43 cases of supravaginal hysterectomy the time consumed in the operation was less than one hour. If one can do a complete hysterectomy in less than an hour perhaps the time element in the operation is not such a great factor as it was thought to be. Even in those cases where the operation lasted an hour and a half the difference in time between a complete and a supravaginal hysterectomy was only $6\frac{1}{2}$ per cent longer for the complete hysterectomy. We have a bacterial flora in the vagina which we have to deal with in complete hysterectomy and the morbidity and mortality depend upon that and subsequent infection rather than the time element.

I was impressed with Dr. Kennedy's technic. Utilizing the uterosacral ligament for the closure of the pelvic diaphragm is very important. We all close the vaginal wall as he does, but do not utilize the various structures coming off the uterosacral ligaments where an enterocele is very likely to start.

DR. F. C. HOLDEN.—I disagree with the speaker on the indications for complete hysterectomy.

I also feel that in the hands of most men that the increased time of operation means increased chance of hemorrhage, increased chance of injury to the ureter, increased opportunity for infection, plus, in nonparous women, the shortening of the vagina that goes with it, something which is very frequently overlooked in doing a complete hysterectomy and bilateral oophorectomy in nonparous women.

I notice he did this operation in 79 cases of myoma, in cases of fibrosis which we would treat perhaps with x-ray. With the use of the cautery and diathermy

on the cervix preoperatively, we feel that the indications for complete hysterectomy are very likely diminishing inasmuch as we do not do any more complete hysterectomies for carcinoma of the cervix.

DR. KENNEDY (closing).—In answer to Dr. Ward's question: Does this technic give a better support after operation than other methods? In my hands it gives a very much better support and a very much better vaginal vault.

In regard to Dr. Rawls's remarks about cystocele, I have done three cases of cystocele in patients who have had a fairly good pelvic floor and have been rather pleased with the way the anterior vaginal vault stays up following this technic. However, I cannot report on any number of cases.

In relation to the time of operation: my time in this series has been very varied, the shortest being forty-three minutes and the longest two hours and fifty-five minutes, depending on the amount of work required.

I did not bring the subject of infection following this technic up in the paper, but it seems to me that in cutting across an infected cervix there is more liability to distribution of an infection than there is by cutting across a vaginal vault which has been iodinated. In all these cases we thoroughly iodinate the vagina and as far as I have seen there has not been any more morbidity from this procedure than from supravaginal hysterectomy.

Regarding Dr. Grad's point of view, I would say that as far as morbidity goes, I have made quite a study in a large number of cases and at the present time am going over a series of about 500 cases. There seems to be very little difference in morbidity between supravaginal and complete hysterectomy.

In respect to the indications for complete removal of the uterus, I would state that many of these patients had symptoms of bleeding, with hypertrophied cystic cervixes which had been treated and it seemed to me, looking over the situation and summing it up, that the procedure of the removal of the cervix at the time or near the time of menopause was a better procedure in the cases that came under my care than the supravaginal technic.

PHILADELPHIA OBSTETRICAL SOCIETY

MEETING OF JANUARY 2, 1930

DR. STEPHEN E. TRACY reported **An Interesting Observation on What Happened in One Case After an Interposition Operation for the Cure of Cystocele.**

During recent years, the interposition operation has been extensively used for the cure of cystocele and some cases of prolapse of the uterus. It is an excellent procedure in certain well selected cases. That it is followed by a rather large percentage of failures is well known.

Not until recently did we have the opportunity to note from within the peritoneal cavity how the organs adjust themselves to the changed positions. It is on that observation that this report is made.

Mrs. F., aged fifty-seven years, was the mother of one child, delivered by forceps twenty-six years ago.

One year after delivery she was operated upon for the repair of lacerations and the correction of a retrodisplacement of the uterus. The operation was unsatisfactory as she obtained no relief from her symptoms.

Menopause took place at the age of fifty years.

When she came under observation she complained of a distress in the pelvis and of a bearing down sensation, and stated that something descended.

Examination showed a relaxed perineum with an unusual amount of scar tissue. There was a well-marked cystocele. The uterus was small and retrodisplaced, but there was no descensus. The cervix uteri was normal.

On February 12, 1929, she was operated upon and the uterus was brought down into the vagina in front of the bladder. The bladder peritoneum was sutured to the posterior wall of the uterus at the level of the internal os. The fundus uteri was anchored under the subpubic ligament by two chromic catgut sutures. The vaginal walls were resected and then sutured with interrupted catgut sutures each of which caught up fibers of the anterior wall of the uterus. The scar tissue was dissected out and with much difficulty a fair perineum was constructed. The patient had a normal convalescence and was discharged from the hospital in good condition.

She came to the office six weeks later and stated that something had happened as she was uncomfortable and could feel a hard lump just within the vulva.

Examination showed that the cervix uteri was near the vulva. The body of the uterus was freely movable and at no place attached to the anterior vaginal wall. There was no cystocele.

It was suggested that a small pessary be inserted. She rejected the proposition and insisted on further operative treatment and returned to the hospital in April for operation.

When the abdomen was opened it was supposed the bladder would be found posterior to the uterus, but such was not the case. As the uterus had descended, the bladder had traveled up over the fundus and was in normal position, anterior to the uterus.

DR. J. O. ARNOLD presented a report of a case of **Abdominal Pregnancy Two Months Past Term.**

This patient was brought to the Maternity Clinic of the Temple University Hospital by the doctor who had been called in when she thought she was going into labor, some two months before.

Her history may be summarized as follows: a colored woman, thirty-nine years old, in her fifth pregnancy, having had four normal pregnancies and normal deliveries, with four living children, the oldest nineteen and the youngest nine. Always had good health and able to work hard at domestic employment.

Her last regular menstruation was some time in November, 1928, with slight irregular bleeding for several months afterward, and some "morning sickness" occasionally for several months.

She felt life some time in April, and was able to continue her work as usual until July, when she gradually became incapacitated because of abdominal distress and pain located chiefly in the lower left side. By the eighth month she was compelled to give up work entirely. Confinement was expected about the middle of September, and on September 18 she had what she thought was rupture of the membranes, with a show of blood and vague, irregular pains in the abdomen, which she supposed to be the onset of labor. These pains continued with decreasing severity for about twelve hours. A physician was called for the first time, at the beginning of this supposed labor and found what appeared to be a normal, full-term pregnancy, with a large child whose movements were easily noted, and heart sounds distinctly heard. On a second visit, after the pains had ceased, no heart sounds or fetal movements could be discovered and repeated examinations in the next few weeks were likewise negative as to signs of life, as well as to any further indications of labor. A small hard tumor, the size of a fist was found in the lower right quadrant of the abdomen, in front of the fetal mass, and the patient stated in explanation of this tumor, that some years before she had been examined and told she had a "growth of the womb."

After two months without further signs of life or labor, she was brought to the hospital (November 20, 1929).

Having seen a similar case many years ago, a diagnosis of abdominal pregnancy was readily made in this instance, as in the former case, by the very simple expedient of manipulating and observing for a few minutes the supposed fibroid tumor in the lower abdomen. I call attention to this point because in the two cases I have seen, and in four out of six cases more recently reported in the journals, there had been a diagnosis of fibroid tumor complicating normal pregnancy while the real condition remained unrecognized by the first physician called.

It was soon found that this tumor was contractile and was not fibroid, but was the uterus. But the patient had had four uneventful deliveries without disclosing anything abnormal, and therefore an anomalous uterus was hardly probable. Still, the fact that the sack surrounding the child seemed not unlike the walls of a distended uterus, and could even be made by manipulation to show some contractions, was undoubtedly somewhat disconcerting. To offset this, however, were the very typical contractions and relaxations of the small tumor, the uterus and, in addition, one could palpate what appeared to be the round ligament, and other ligamentous bands running off from the left cornu of the uterus into the abdominal sack. The small tumor was also movable to a considerable degree, independent of the larger mass. Vaginally, one could easily identify the portio vaginalis as a part of the smaller abdominal tumor. The placenta extended over the inlet on the left side. There was slight vaginal bleeding which the patient stated had been more marked at times, but never profuse.

A skiagraph made at this time confirmed the diagnosis of breech presentation and also of a dead baby, as could be readily inferred from the marked overlapping of the skull bones. Operation, November 21, 1929. Upon opening the abdomen, under ethylene anesthesia, the above findings were at once verified. The small tumor was found to be a normal uterus enlarged to about the size of a two months' pregnancy.

The abdominal sack containing the fetus was rather thick and strong and had its base or origin in the region of the left broad ligament, extending into the pelvic cavity. It was entirely free from adhesions or attachments at any other points.

When the bag was incised, a thick foul, brownish fluid escaped and a large child, weighing almost nine pounds, was found in an advanced state of decomposition. It was deemed inadvisable to attempt to remove the placenta because of its location. The sack was packed with gauze, and its margins sutured to the lower portion of the abdominal wound, which was left open.

The operation took but a few minutes and there was no more bleeding than in a normal delivery.

The patient's condition remained good until she was removed from the operating table, when she suddenly went into profound shock, became pulseless, and died in about two hours. Autopsy, unfortunately, was not permitted. No blood was found in the abdomen except that contained in the gauze packing and dressings.

I am at a loss to know why this patient so suddenly collapsed. She had had no elevation of temperature, but did have a somewhat subnormal blood count, 3,200,000 red cells, 5,000 whites, and only 54 per cent hemoglobin. It is possible that we operated inopportunately, at a time when she was going through a period of greatly lowered resistance because of a toxemia from the disintegrating child. Operation a few weeks earlier before this period set in, or as the history of some of these cases seems to suggest, considerably later, when the patient had passed through and recovered from whatever toxemia she suffered, might have been attended with better results.

DR. CHARLES A. BEHNEY reported two cases of **Acute Sigmoid Diverticulitis**.

CASE 1.—Mrs. L. D., white, aged twenty-two, was admitted to the Gynecologic Service of the Chestnut Hill Hospital, September 22, 1929, complaining of frequently recurring dull pains in the lower left abdominal region, radiating to the left thigh and back. This symptom had first made its appearance shortly after a miscarriage in August, 1928. There was moderate constipation and abdominal discomfort described as "gas pains." Nocturia (2-3 times) and frequency had been present for one month at the time of admission.

The past history revealed nothing bearing upon the present condition, and nothing suggesting disease of any major system. Dilatation and cauterization of the cervix had been performed five years previously for leucorrhea. The patient's two pregnancies had both ended in miscarriages, the second of these occurring four months before admission. The menstrual history was in no way abnormal.



Fig. 1.—Low power.

The patient was rather obese and, at the time of examination, seemed in no pain. There were a number of carious teeth and palpable cervical glands. The chest was emphysematous but the heart normal. Thickness of the abdominal wall rendered abdominal examination difficult; no masses were palpable, but there was definite tenderness in the left ovarian region. The cervix was slightly lacerated, the fundus of the uterus was retroflexed. The right adnexa could not be palpated, while in the region of the left ovary an exquisitely tender and firm, but not adherent mass was noted, which felt like an elongated ovary.

Blood Count: Erythrocytes, 3,850,000; leucocytes, 6,600; hemoglobin, 78 per cent; sedimentation time, ninety minutes; Wassermann reaction, negative; urinalysis, normal.

An exploratory laparotomy and suspension of the uterus were decided upon. At operation the adnexa were found to be normal. Almost touching the left ovary there was found a structure that looked like an acutely inflamed epiploic appendage, springing from the midportion of the sigmoid. This was excised and the stump inverted. A Coffey suspension and routine appendectomy were done. The

incision healed by first intention and, after a normal convalescence, the patient was discharged in good condition eighteen days after operation.

Pathologic Diagnosis.—The specimen was a small tumor, 1.5 x 1.5 x 2.0 cm. On section, it resembled an inflamed epiploic appendage.

Microscopic: The general architectural arrangement was suggestive of a hollow viscus lined with mucosal folds, the stroma of which was an extension from the muscularis. One-half of the specimen was necrotic, so much so that the tissue structure was not recognizable. The remaining portion showed mucosal folds, with unusually large and swollen epithelial elements. The cytoplasm appeared necrotic in places but the nuclei were normal. The basement membrane was present in normal relation. Epithelial desquamation was pronounced, with an occasional crypt (or what appeared to be one) seen in cross-section. The necrotic material had undergone a fatty caseous change, and large fat droplets were evident in some of the epithelial cells. Areas of moderate fibrosis were present



Fig. 2.—High power.

showing hyaline or more advanced degenerative changes. There was a moderate mixed polymorpho- and mononuclear infiltration. Red blood cells were easily found scattered throughout the section.

Evidently, this was a case of necrotic degeneration of a diverticulum of the intestine, apparently the end-result of a chronic condition, although at one time considerable exudate must have been present in the lumen.

Diagnosis.—Diverticulitis.

CASE 2.—Woman, white, aged forty, was admitted to the Gynecologic Service of the University Hospital, February 8, 1929, at 10:15 P.M., complaining of pain in the lower right abdominal region. Three days previously she developed a lower right abdominal pain, becoming localized at McBurney's point. Since then the pain had persisted and she had vomited several times. Her bowels were regular. There were no urinary symptoms.

There had been a similar but more severe attack three years before, and her periods had been somewhat irregular from then on.

On admission, the temperature was 98.2° F., the pulse 92, and respirations 20.

The patient was a rather poorly nourished adult female, apparently fairly comfortable. There was marked right rectus rigidity, with exquisite tenderness over McBurney's point. The pelvic examination showed nothing abnormal, except a smooth hard mass the size of an orange, apparently springing from the left side of the fundus, the uterus moving with the tumor.

Blood Count: Erythrocytes, 4,100,000; leucocytes, 11,900; hemoglobin, 80 per cent. Urine normal.

A diagnosis of acute appendicitis and subperitoneal myoma was made, and an immediate abdominal section decided upon.

At 1:35 A.M., a midline incision was made, which exposed a dermoid cyst of the left ovary, adherent to the left cornu of the uterus. The appendix could not be found in its normal position nor the cecum felt in the right iliac fossa. In its place was discovered the sigmoid, attached to which was found an enlarged gangrenous epiploic appendage, adherent to another epiploic appendage which was normal in size but acutely inflamed. These were both ligated and removed and the dermoid cyst excised. The cecum and normal appendix were located in the left iliac fossa, and a routine appendectomy performed. The gall bladder, liver, and pylorus were found in the upper left abdominal region, while the spleen was felt on the right side, a complete situs inversus abdominis. Before closure, the heart was felt through the diaphragm on the right side of the thorax.

Examination by Dr. Cooper verified these thoracic findings.

Gastrointestinal x-ray examination by Dr. Pancoast showed transposition of stomach, duodenum, and colon.

Electrocardiographic examination by Dr. Wolferth: P-waves inverted. P-R intervals, 0.14 second. QRS complexes inverted in Lead I. T-waves inverted in Lead I.

Tracing showed dextrocardia, with inversion of all waves in Lead I, and Leads II and III transposed. No evidence of cardiac disease.

Pathologic Diagnosis.—Teratoma cystica ovarii; diverticulum; enlarged gangrenous epiploic appendage.

After an uneventful convalescence, this patient was discharged in good condition twenty-two days after operation, and has been symptom-free up to the present time.

While many cases of complete situs inversus are on record and numerous references have been made to its association with acute left-sided appendicitis, we have been unable to find any report on this condition complicated by acute diverticulitis of the sigmoid simulating acute right-sided appendicitis. The fact that the complete transposition of the viscera (and especially the dextrocardia) was completely overlooked in the preoperative examination by the ward intern, indicates the great care which general physical examination deserves, even before emergency operations.

In both of these patients, operation was undertaken for the correction of commonplace abdominal lesions, namely, ovarian tumor and acute appendicitis. On exploration of the peritoneal cavity, however, a relatively uncommon condition, acute diverticulitis, was discovered in each instance. It appears reasonable that this lesion might occur more frequently than is generally believed and it should, therefore, always be looked for when operations for diseases of the pelvic viscera, (sepecially those of the left side) fail to reveal the anticipated pathologic condition.

DR. ARTHUR FIRST AND DR. LEOPOLD GOLDSTEIN presented a paper entitled **Anemia in Pregnancy**. (For original article see page 70.)

DISCUSSION

DR. P. B. BLAND.—I wonder whether the investigations outlined in recent contributions to the literature have not been carried on to settle once and for all the many conflicting statements in our textbooks regarding this question, for the opinions

expressed in modern obstetric textbooks vary widely. No two seem to be alike, and I imagine this is due probably not to personal investigation carried on by an individual writer, but rather to the incorporation of opinions expressed by others.

As a student I gathered the impression that pregnancy was almost invariably associated with an unusual richness of the blood. Until quite recently it was generally assumed and taught that there occurred in pregnancy an increase both in the quantity and quality of this vital element. The change was and still is customarily described as "the plethora of pregnancy," and it seemed to be taken more or less for granted that in nearly every pregnant individual, not only was there an increase in the watery constituent of the blood, but in all others as well.

According to recent studies, this assumption appears to lack foundation.

For many years I have been impressed, also, by the observation that not all pregnant women present the ruddy glow of health. On the contrary, I have found a large percentage who displayed, not a picture of ruggedness, but definite systemic signs of a slight or moderate degree of anemia.

DR. LEOPOLD GOLDSTEIN.—In a previous study on this subject, the results of examinations of 100 private maternity patients were compared with those of the ward patients, in order to determine if environment and living conditions may have any bearing on the incidence of anemia in pregnancy. Since all of the private patients were examined at term, only those ward patients who had counts taken at term were selected for this comparison. The red cell counts and hemoglobin estimations of 179 ward patients were available for study.

It was found that about 62 per cent of the private patients had a hemoglobin percentage of less than 75, as compared with over 80 per cent of the ward patients. Over 40 per cent of the private patients gave normal counts, as compared with only 14 per cent of the ward patients. The percentage of ward patients having under 3.5 million cells at term (52 per cent) was twice as great as that of private patients (26 per cent).

The fact that so many private patients as well as ward patients were affected suggests that factors concerned directly with the pregnant state may have been responsible for the anemia. The influence of better environment and living conditions, however, may account for the lower percentage of private patients manifesting anemia.

BROOKLYN GYNECOLOGICAL SOCIETY

MEETING OF FEBRUARY 7, 1930

DR. M. ROSENBERG presented a report of a case of **Primary Broad Ligament Fibromyoma with Sarcomatous Degeneration.**

Patient M. L., aged thirty-seven, married, obese, not acutely ill, was admitted to the private service of Dr. Leo S. Schwartz at the Jewish Hospital of Brooklyn on October 21, 1929, complaining of difficult and frequent urination.

Patient was married thirteen years and had two children, the eldest being eleven years and the youngest five years (latter delivered by high forceps). The existence of a pelvic tumor was known during this last labor. Menstrual history normal. Last period October 6, 1929.

Although patient was aware of the presence of a pelvic tumor, no symptoms appeared until about four months prior to admission to hospital, when she experienced difficulty in urination and, although the desire was frequent, she was unable to void. This was soon accompanied by dysuria, the condition becoming progressively worse, as she was only able to void in drops after initiating a flow of urine. There was no hematuria at any time.

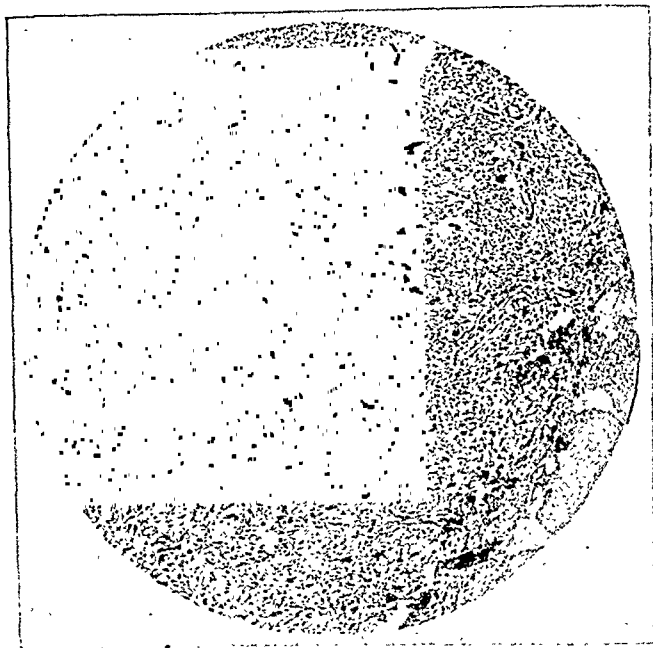


Fig. 1.

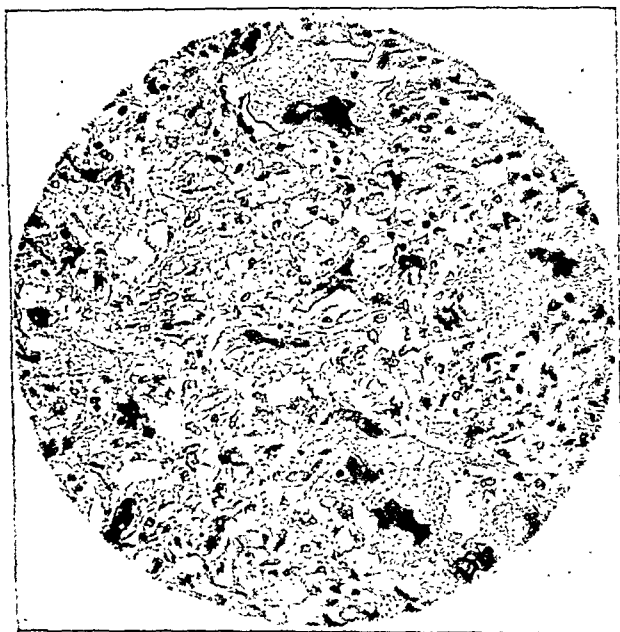


Fig. 2.

Examination disclosed an insensitive mass in the median line above the symphysis.

A large, hard, movable mass occupied the entire culdesac, descending almost to the introitus. The parous lacerated cervix was pushed up behind and above the symphysis. The uterus was small, pushed up high by a mass as previously described which appeared to be about the size of a large grapefruit. Adnexa not felt. Preoperative diagnosis: Intraligamentous fibromyoma.

Laboratory data: Urine normal; blood pressure 135/85; red blood cells 4,400,000, hemoglobin 90 per cent, white blood cells 9,000, polys 62 per cent, lymphocytes 37 per cent, mononuclears 1 per cent.

Operation.—Spinal anesthesia, paramedian incision.

Exploration showed a small uterus with several small fibroid nodules; both tubes and ovaries apparently normal; adhesions of sigmoid to left broad ligament; large tumor mass occupying the pelvis, encroaching upon the bladder and rectum; appendix long and nonpathologic. A supracervical hysterosalpingo-oophorectomy was done first, in order to make possible an approach to the tumor. This was followed by difficult enucleation of a left intraligamentous fibroid which extended into the right broad ligament; resection of part of capsule and suturing of capsule stump. Abdomen was closed in the usual manner.

Patient made an uneventful recovery and was discharged on the fourteenth day free from symptoms.

On discharge the general condition was good, abdominal wound healed by primary union; parous pelvic floor; lacerated cervical stump; pouchiness in posterior fornix; lateral fornices free.

Postoperative follow-up examination six weeks later by Doctor Schwartz revealed that the infiltration in the posterior fornix was resorbed and the cervical stump freely movable. In view of the pathologic findings the patient is at present receiving deep radiotherapy.

Pathologic Findings.—Specimen consisted of uterus, both tubes and ovaries, a large nodular firm gray intraligamentous tumor mass.

The uterus measured 7 cm. long, 6 cm. transversely, and 3 cm. in thickness and contained several subserous and intramural gray masses. The wall was 2.5 cm. thick and the endometrium 4 mm. in thickness, covered with blood clot at numerous points. The tubes were normal. In the ovaries were numerous cysts containing clear fluid.

The intraligamentous tumor mass measured about 8 cm. in diameter, 12.5 cm. long, nodular and grayish yellow in color, firm in consistency, and on section showed several areas of softening with brown yellow discoloration.

Microscopic examination of the masses in the uterine wall showed whorls of fibromyomatous structure. There was no evidence of malignant degeneration in any of these subserous and intramural nodules. The endometrium showed glandular hyperplasia. The ovaries were the seat of several follicular cysts.

The intraligamentous tumor mass was made up of spindle cells with interlacing bundles of fibrous tissue. The degenerative areas showed a spindle-cell sarcomatous degeneration with numerous giant cells within the area of degenerated sarcoma.

This case, I believe, demonstrates an independent broad ligament fibromyoma that has undergone sarcomatous degeneration.

DR. E. V. LITTAUER presented a report of a case of **Hydatidiform Mole with a Viable Fetus**.

Mrs. R. T., aged twenty-six, admitted to the service of Dr. Schwartz in the Jewish Hospital on October 3, 1929. Discharged December 1, 1929. Her chief complaints were vaginal bleeding, vomiting, chronic cough, dyspnea, palpitation. Family history negative and irrelevant. The patient had had typhus fever at

twelve. Following the delivery of her first baby three years ago, patient developed rheumatic fever and has suffered with cardiac trouble ever since. A tonsillectomy was done two years ago. Last menstrual period June 11, 1929.

Since her last menstrual period, approximately four months previous to admission, patient began to complain of dyspnea, palpitation, and precordial pains. She also noticed that she stained slightly every two to three days. This caused no concern until three days previous to admission, when she suddenly experienced a rather brisk hemorrhage.

Physical examination showed mitral stenosis and regurgitation, auricular fibrillation, and cardiac decompensation.

A uterine mass could be palpated in the lower abdomen, extending from the pelvis to within four fingers' breadth of the umbilicus. It was smooth, symmetrical and freely movable. No other masses were felt. Fetal heart not heard. Bimanual examination showed the uterus enlarged to the size of a four months' pregnancy, soft and freely movable. No bleeding noted.

Conservative treatment was instituted in order to improve the cardiac status sufficiently so as to enable us to interrupt the pregnancy. Laparotomy with sterilization was the procedure that was decided upon.

On October 17, that is, fourteen days after admission, under local anesthesia, a hysterotomy and bilateral sterilization were performed. The uterine contents consisted of the following: A perfectly normal fetus, 14 cm. long, with digits and genitalia well defined, some apparently normal placental tissue and a mass of grape-like tissue which, microscopically, was made up of degenerated villi which were undergoing enlargement and cyst formation. Syncytial tissue masses surrounded many of these degenerating villi. The ovaries were normal in size and showed no evidence of cyst formation.

We might here be confronted with the following problem: Was this a twin pregnancy in which one had undergone hydatidiform degeneration, while the other was to have developed into a full-term normal fetus? Or was it a single pregnancy with hydatidiform changes in the placenta which were not interfering with the development of the fetus? I am of the opinion that this was a single pregnancy with very marked and extensive macroscopic hydatidiform changes in the placenta. I could find no case in the literature that described such marked gross changes in the placenta in the presence of an apparently normal fetus.

DISCUSSION

DR. SAMUEL A. WOLFE.—My experience with the pathologic examination of hydatidiform moles of this particular type consists of a specimen removed about three years ago at the Long Island College Hospital. In that instance there was a definite case of twin pregnancy with a hydatidiform degeneration in one ovum and a normal placenta and viable fetus in the second ovum.

It is interesting to note particularly the relation of hydatidiform mole to choriocarcinoma. For example, in Veit's *Hand Book* in a discussion of the etiology of choriocarcinoma, Veit definitely states that it is his firm belief that in every case of choriocarcinoma there has been an antecedent hydatidiform mole, in most instances microscopic in type and not grossly recognizable.

DR. I. C. RUBIN read a paper (by invitation) entitled **Tubal Strictures and Their Localization by Uterotubal Insufflation and the Kymograph.** (For original article see page 28.)

DISCUSSION

DR. J. EARL MILES.—I have put patients who apparently had normal tubes through the gamut of carbon dioxide insufflation before and during laparotomy. These were cases of chronic appendicitis, the patients granted me the privilege of

using an instrument to test the patency of their tubes. The instrument I used lately was one of my own design.

There was no appreciable change in the pressure necessary to insufflate the tubes before or during the ether anesthesia.

DR. RUBIN (closing).—In studying the question of pain in cases with stenosed or occluded tubes, I have often noted just at what point measured in millimeters of mercury the patient said she began to feel the pain. In most cases they begin to complain of pain at about 120 or 140, just as Dr. Cary found.

The slower, the more careful, the more gentle one is in doing an examination, the more certain one is to get accurate data. There is no doubt that brusque handling of the uterus provokes spasm. The factor Dr. Duncan called attention to, namely, the rate of the flow, may also be measured in terms of quantity of flow and time as well as in pressure and flow, which amounts to practically the same thing.

The main caution is against too much speed. I remember an experience that the late Dr. Studdiford had when he first did insufflations. He was doing a laparotomy with the cannula in the uterus. An oxygen tank was used as the source of supply for the gas, an old-fashioned tank with a loose handle. One of the spectators in great anxiety to see what was going on at the laparotomy, brushed by and forced a terrific amount of gas to flow into the uterus. The tubes ruptured with explosive force. Fortunately they were under direct vision in the abdomen and no harm resulted. Now, of course, that is an avoidable accident. It did no harm in that particular case, but it could do great harm under other circumstances.

Three fatalities which have come to my notice were reported by me, as well as by Dr. Moench, in women who were subjected to this test for sterility. One of them had myocardial disease and diabetes. In all three cases the doctor carrying out the test was doing it without any attempt to acquaint himself thoroughly with the technic and the presence of contraindications.

Too much emphasis cannot be given to the question of when the test may not be done. The indications can be summed up briefly: Its specific use is in sterility cases, to establish the fact of patency or nonpatency, and that is all. I never perform uterotubal insufflation in the presence of pelvic tenderness, no matter how slight. There is no reason for haste in a case of sterility of two, three, five or six years' standing. One can postpone the test for six months if necessary, awaiting the time when all tenderness and all contraindications are gone. Of course, endocervicitis is a very decided contraindication and requires treatment preliminary to the test.

In the beginning I subjected the patients to bacterial examinations and to the sedimentation time test, taking the temperature for twenty-four hours after pelvic examination and then examined the patient again for tenderness. The experienced gynecologist does not need to resort to these routine laboratory examinations in the presence of a clean cervix with no purulent secretion or palpable mass, and in the absence of tenderness.

There are cases where the pressure reaches 160 or 180 mm. Hg. and then drops. The patient gets no shoulder symptoms. If one examines the patient immediately after, he may detect a flaccid, distended tube on one side that he did not feel before. In extirpated specimens I have demonstrated that sometimes as much as 100 c.c. can be introduced into a dilated tube which clinically may have caused no symptoms whatsoever.

In some cases in spite of a fall in pressure there are no positive auscultatory signs, no shoulder pains. But fifteen or twenty minutes after the examination the patient may say she has pain in one shoulder; when you fluoroscope her you find

she has an air meniscus under the diaphragm. This points to the presence in the pelvis of adhesions which captivate the gas for a while and from which it liberates itself a little later rising to the diaphragm.

That leads me to another point that Dr. Duncan raised. He said he saw free air under the diaphragm by fluoroscope and yet the tubes were closed. You must be careful to determine whether the air is on the left side or on the right side. An air bubble is almost constantly present in the stomach and may be confusing. When the gas is on the right side it is absolutely pathognomonic. In case of doubt when the gas is on the left side and is scanty in amount I place the patient on the left side and make pressure on the right costal margin which forces the gas to the right side. By fluoroscopy you can then see a meniscus of gas under the diaphragm on the right side.

The method of introducing water into the vagina as Dr. Furniss first recommended, with the patient in the tilted position, is very useful. I have not felt the need of that because with the ear rather close to the vagina one cannot fail to detect cervical regurgitation. When one is not experienced in distinguishing cervical leaks, this is perhaps a wise thing to do.

In the majority of cases I think it suffices simply to hold the rubber acorn very firmly in the cervix against the bullet forceps which grasps the anterior cervical lip. I do not feel that the self-retaining instruments which are devised for absolute air-tightness of the cervix need be used.

Dr. Cary stated that with his fingers he can feel certain differences in pressure. There is no doubt but that with increasing experience one can distinguish between various pressures, but still if you test it against a kymograph and see the kind of curves you get, you will be surprised. With the kymograph and a uniform pressure and rate flow, you can make more accurate observations and interpretations. I prefer not to rely upon my subjective sensations.

Dr. Miles referred to strictures being found at laparotomy. Passing a Pollitzer bulb through the fimbriated end will demonstrate the nearest stricture. If this is impassable the other intrinsic strictures can only be guessed at. Insufflating through the uterus with the cannula in situ can show the stricture nearest the uterine ostium.

CHICAGO GYNECOLOGICAL SOCIETY

MEETING OF JANUARY 17, 1930

DR. F. LEE STONE presented an **Instrument for Determining Tubal Patency**, which was described in the January, 1930, issue of this JOURNAL.

DR. A. F. LASH presented a specimen of **Ectopic Corpus Luteum Associated with Ruptured Tubal Pregnancy**.

This specimen was obtained from a white woman thirty-eight years of age who was admitted to the County Hospital with a clinical picture of ruptured ectopic pregnancy. The specimen was presented as a pathologic rarity, if one were to accept what recent investigators (Dolgopel) say about ectopic corpus luteum, in that there are only twenty-four such reports in the literature up to 1920.

DR. NORBERT ENZER, of Milwaukee, reported a case of **Endometrioma of the Umbilicus**.

A tumor of the umbilicus was removed from a girl 18 years of age. The tumor had been present for six months and was not painful. A few days before the

removal it discharged some blood, which was ten days after the last menstrual period. The tumor was a nodular growth with an apparently intact skin surface. The cut section showed a diffuse fatty and connective tissue tumor.

Microscopic section revealed a thin layer of squamous epithelium, with the main portion of the tumor made up of connective tissue cells and smooth muscle fibers. Imbedded in these were numerous glands lined by columnar epithelium, some of them quite small, others dilated, occasionally single but more often multiple. They were surrounded by a dense cellular stroma, many of them containing blood and being surrounded by blood. Desquamated epithelium was occasionally present. The peritoneal surface of the tumor was particularly interesting because of a deep indentation, sections through which revealed numerous prolongations of the peritoneum into the tumor and several gland structures which could be traced directly to the peritoneum. These latter were lined by low cuboidal epithelium of the goblet type, surrounded by loose connective tissue stroma.

The appearance of the glands, the stroma, the hemorrhage, the connective tissue led to a diagnosis of endometrioma.

There were several points of interest in this tumor. The patient was younger than any that were encountered in the literature. The finding of glands directly continuous with the peritoneum strongly supported the serosal origin of these endometriomas. The presence of the gland lined by mucus-secreting cells lends some support to the origin of this tumor being from the omphalomesenteric duct. The smooth muscle was likewise of importance. If one interprets an endometrioma on the basis of Sampson's theory, it is a little difficult to understand how smooth muscle occurred in these tumors. At the umbilicus there was an embryologic basis for the occurrence of smooth muscle. This case will be published later in more detail, with a survey of the literature.

DISCUSSION

DR. SIDNEY SCHOCHET.—I believe more firmly than ever Sampson's view that endometrium arises from the müllerian tissues. The only way we will be able to prove definitely that these endometriomas are similar in character to endometrium would be to get a very fresh specimen, have it properly fixed and study the cells. In other words, the growth morphology is no criterion as to whether it is an endometrioma.

DR. CAREY CULBERTSON.—While this tumor of the umbilicus was a glandular type, it is a mixed one. Even though it may be shown that some of the glands are endometrial in type, there are others that are different, in part like an adenomyoma. Aside from this difference, I agree with Dr. Schochet that it will require further cytologic study to prove that even some of those glands are endometrial in origin.

DR. E. D. PLASS, OF IOWA CITY, IOWA, (by invitation) read a paper on **Trichomonas**, which was discussed by Drs. Cron, Reis, Lash, Parsons, Evans, and Davis.

DRS. CARL H. DAVIS AND G. W. STEVENS presented a paper entitled **Value of Routine Radiographic Examinations of the Newborn, with a Study of 702 Consecutive Cases.** (For original article see page 73.)

DISCUSSION

DR. A. H. PARMELEE.—During the last few years at the Cook County Hospital, we have studied many newborn infants with the x-ray. Our particular study was in regard to congenital syphilis but a lot of interesting things have

arisen in taking these pictures of babies for congenital syphilis. We have taken pictures of the whole body as a rule. A great many of Dr. Davis' babies showed apparently very large thymus shadow and apparently very large hearts. Of course, one has to be careful in the interpretation of x-ray pictures of an infant with regard to the size of the heart and the size of the thymus, because of the variability of conditions at the time the picture was taken. For instance, in several of these pictures I have looked at tonight where the thymus and heart shadows were very wide, the diaphragm is very high and consequently that modifies the picture. We must interpret these pictures depending on the location of the diaphragm when the picture was taken. Naturally symptoms come from an enlarged thymus but there are a lot of babies who have a wide mediastinal shadow which appears to be an enlarged thymus with no symptoms, as Dr. Davis has said. I believe it would be unnecessary and unwise to give x-ray treatments to those children unless there was some very definite reason from the standpoint of symptoms. I am absolutely convinced from our studies of congenital syphilitic infants and infants of mothers with congenital syphilis, that with x-ray examination of the newborn we have probably the most important evidence in the diagnosis of congenital syphilis. Wassermann and Kahn reactions are notably apt to be absent in the first few weeks of life and in the first few months, perhaps. Syphilitic osteochondritis may be the first thing found. One of the things that struck me as particularly interesting was that there were six cases that had apparently spontaneous pneumothorax. I have observed one or two in the last couple of years. One in particular was in an extreme state of dyspnea and had a very marked spontaneous pneumothorax, probably from the blocking of a bronchus and the lack of aeration on one side and a pulling away of the parietal from the visceral pleura.

DR. FREDERICK H. FALLS.—I would like to ask Dr. Davis if I understood correctly that one per cent of these babies have spontaneous pneumothorax and also if in those cases a tracheal catheter was inserted and artificial respiration performed.

DR. BEN. F. FEINGOLD.—I think that the incidence of enlarged thymus is greatly overestimated. The broad shadow which appears along the margin of the heart and is so frequently diagnosed as enlarged thymus, in most cases is due to a normal dilatation of the great vessels, or a pushing up of the diaphragm by the stomach. It is interesting to notice in Dr. Davis' paper that a number of cases which were clinically diagnosed enlarged thymus upon roentgenologic findings, showed, when autopsied, other factors, as congenital heart disease and especially cerebral hemorrhage as the cause of death. I had the privilege about a year ago of doing autopsies on a large series of newborn children. Of this group many had a clinical diagnosis of enlarged thymus, but autopsy showed either cerebral hemorrhage or atelectasis as the cause of death. In these cases the thymus varied in size from about 8 to 20 gm. It is interesting that even in those cases having a thymus weighing about 20 gm. there was no history of a thymic syndrome. In our experience at the Lying-In Hospital during the past year, with about 1,500 newborns, we have not had a single case of so-called enlarged thymus clinically.

DR. RUDOLPH W. HOLMES.—I have always been led to believe that the thymus of the newborn baby was disproportionately large, and so remained for a period after mature birth; was, in fact, large before birth as it was a necessary organ for normal intrauterine growth—later assuming secondary characteristics and diminishing in size. Also, that all babies were born atelectatic; after respiration had begun aeration was largely confined to the apices and posterior aspects of the lungs; gradually, expansion took place in the remainder of the lungs so

that full respiratory activity was evident after some days. I wonder if these extremely good x-ray pictures are not but demonstrating characteristic normal attributes of the newly born!

Only two babies delivered by me have died of status lymphaticus—and both of these died when some months old. The cause of death was determined by expert pathologists. One was found dead in its crib when taken up by the nurse in the morning. The other was taken out for an airing and, on returning home, the nurse found the baby had died during this period.

I believe there is too much anxiety over the reputed dangers of x-ray to the baby, born and unborn. The first weeks of pregnancy we must believe that actual menace exists, but later the extremely short exposure for a picture, or even a series, is of no moment. I feel that the same holds true of children in infancy. Therefore, I cannot believe that the taking of these pictures jeopardizes the infants.

DR. E. D. PLASS, IOWA CITY, IOWA.—We have not had a single baby come to necropsy when the pathologist has been willing to blame the death upon an enlarged thymus. I have, however, seen one child who at the age of six months presented the clinical and roentgenologic evidence of enlarged thymus, and who responded favorably to x-ray therapy.

DR. DAVIS (closing).—Our percentage of thymus hypertrophy is lower than that usually reported in studies of the newborn. A few years ago nearly all the clinics that were making such studies reported from 39 per cent to as high as 45 per cent of the newborn showing hypertrophy of the thymus.

The question as to whether symptoms are due to the thymus is a matter of judgment and the twenty babies in this series were treated on the order of the pediatrician. We find that one pediatrician will consider certain symptoms as evidence that the thymus is causing trouble, others may not agree. However, a few years ago I had a baby which was apparently in good condition when it left the hospital, but when it was four or five months old the mother found it dead in its crib. A few months later another patient found her baby dead in its crib at the age of three months. Status lymphaticus was given as the cause of death in the second instance. Another child three weeks old, developed symptoms which the pediatrician thought were due to the thymus. Within a few hours after the first x-ray treatment those symptoms began to disappear and with the course of three treatments they entirely disappeared, but without any change in the size of the thymus.

As regards the lung condition, there were six babies who had pneumothorax. This paper is based on a study of the x-ray findings and it is not possible for me to answer the questions Dr. Feingold asked, regarding the resuscitation.

The x-rays were not taken immediately after birth but were made within two or three days when the lungs would normally have expanded. I will agree with Dr. Holmes that if they are made immediately we would undoubtedly find atelectasis in many more of them.

I do believe that in teaching clinics, where there is close cooperation between the departments of obstetrics and of pediatrics, studies of this sort will be very worth while, but instead of making them from only one point of view they should be followed as part of a complete clinical investigation.

Department of Maternal Welfare

CONDUCTED BY FRED L. ADAIR, M.D., CHICAGO, ILL.

STANDARDS FOR MATERNITY CARE*

Prepared by the Committee on Maternity Care of the Children's Welfare Federation and a special committee appointed by the New York Obstetrical Society

The "Standards" herewith presented have been prepared to serve as a basis for judging and evaluating maternity work. They will later be modified according to the criticisms which it is hoped will follow the circulation of this pamphlet. . . .

Preliminary to the preparation of the first draft of these Standards, the maternity work was observed in a selected group of hospitals with varying policies, procedures, and problems.

In the preparation of these Standards, the Committee has kept in mind the following facts:

1. There is a variation in the technic, administrative policies, and physical arrangement of hospitals and clinics, as well as in the facilities of the private practitioner's office.
2. Institutional and private care of obstetric cases overlap in varying degrees.

GENERAL PRINCIPLES

These Standards are presented in the belief that:

1. Certain minimum requirements for the conduct of obstetric cases are applicable with modifications to organizations and individuals engaged in the practice of this branch of medicine.
2. Adequate maternity care for all mothers in any community presupposes the acceptance of such minimum requirements by all institutions, organizations and individuals giving any maternity service.
3. The aim of adequate maternity care is the minimum of mental and physical discomfort for every woman during pregnancy; the maximum of mental and physical fitness at its termination, with the reward of a well baby and the knowledge whereby she may keep herself and her baby well.
4. Standards developed with institutional practices in mind are as a whole adaptable to private practice with certain minor changes and omissions.
5. Every organization and individual giving maternity care, should make a conscientious effort directly or indirectly to teach the community the value of and the need for medical and nursing care from the time pregnancy is suspected.
6. While independent centers giving prenatal care are at times necessary, it is important that such centers have a definite working agreement with hospital services, for the reception of patients and their subsequent treatment.

*For lack of space these "Standards" are presented herewith in an abbreviated form but those interested may obtain a copy of the complete pamphlet by addressing the Children's Welfare Federation, 244 Madison Avenue, New York City. The "Standards" are of course tentative and the Committee which has prepared them is desirous of comments and suggestions for possible incorporation in subsequent editions.

7. It would appear desirable for each community to establish a local committee on Maternity Care, made up of interested professional and lay groups or individuals. This committee should serve as a clearing house for information, should endeavor to develop improved facilities for obstetric care where these are deficient or lacking, and should stimulate the adoption of uniform standards by those engaged in maternity work.

Section I

Prenatal Care

Prenatal Care is the supervision, care, and instruction given to pregnant women. This care should include:

- A. A visit to a private physician or clinic as early in pregnancy as possible, at which the following points should be noted:
 1. Personal history.
 2. Menstrual record.
 3. History of present pregnancy with particular reference to the occurrence of nausea, vomiting, vaginal discharge, constipation, urinary disturbances, headaches, etc.
 4. General physical examination.
 5. Arrangement for subsequent visits and care at delivery.
 6. Instruction accompanied by printed advice on hygiene of pregnancy.
 7. Abdominal examination, palpation, auscultation, at and after fifth month.
 8. Blood examination, including hemoglobin, red cell count, Wassermann and Kahn tests, if and where possible.
 9. Urethral and cervical smears, where indicated.
- B. Regular visits to the physician or clinic at least once a month during the first seven months, and then every two weeks or oftener as indicated.
Internal and external pelvimetry after seventh month in all cases.
- C. Group teaching in prenatal clinic which will instruct the mother in the care of herself, the preparation for delivery and the care of the baby upon its arrival. . . .
- D. Arrangements for referring of clinic patients to other institutions equipped to give the desired care which for any reason cannot be given by the institution or organization first approached.
- E. A carefully integrated medical social plan for clinic patients, by developing a contact between the clinic and the patient which will help to solve any social or economic problems which may affect the health and peace of mind of the patient or prevent her following instructions.
- F. Home visits by a supervised public health nurse in accordance with the physician's instructions, are desirable both for institutional and private practitioners' patients. . . .
The nurse's visit is of value only if she sends a report of her findings and advice, on each visit, to the hospital or doctor caring for the patient. .
Where public health nurses are advising patients in the hygiene of pregnancy and those patients are not as yet under supervision of a hospital or a doctor, the nurse should work under standing orders from the Medical Committee. . . .

Section II

Delivery Care

- A. General Considerations, for the attending physician or hospital staff:
 1. Every patient in labor should be carefully watched from the beginning until such time after the completion of labor as her condition appears entirely satisfactory.

2. The patient should be kept reasonably quiet.
3. Privacy for the patient during delivery is desirable and should be provided if possible. . . .

B. Hospital Delivery:

Both medical and nursing facilities should be as adequate at night as in the daytime.

Patients admitted in labor should be transported directly to the labor room and not delayed for history taking.

1. Ward Patients,

- a) The resident should be notified when the patient goes into labor, or in hospitals having no resident, the chief of the obstetric service should be notified directly.
- b) The patient should be transferred to a labor room where she should remain until she is ready to be delivered.
- c) A nurse should be assigned to watch the patient during labor; and to give, as far as possible, her undivided attention to the patient and keep the physician informed of the patient's progress and prepare the patient for delivery according to the technic employed by the institution.
- d) The chief of the obstetric service should be responsible for maintaining the medical standards and should be in charge of the delivery service.
 - (1) There should be a graduate doctor assigned to conduct each delivery. . . .
- e) There should be adequate nursing service at delivery. . . .

C. Home Delivery.

1. As a result of prenatal instruction there should be a thorough understanding by the patient of the procedure for summoning physician and nurse at the onset of labor.
2. After labor has started, arrangements should be made to keep the patient under constant observation throughout labor.
3. The nurse's responsibility should include:
 - a) Making the necessary preparations for delivery early in labor.
 - b) Watching the progress of the labor carefully and noting any change in the patient's condition; getting in touch with the physician at regular intervals if the physician should be called away during labor or is otherwise detained.
 - c) Urging the patient to bear down only as and when directed by the physician.
4. The physician should,
 - a) Make necessary examinations.
 - b) Give orders for preparation of patient and "set-up" if patient is in labor.
 - c) Instruct the nurse, if it is necessary for him to leave the patient when she is in labor, as to—
 - (1) Where he may be reached.
 - (2) The name of another physician who is available and should be called if he cannot be reached or has not arrived by the beginning of the second stage of labor.
 - (3) What procedure he wishes her to follow if patient delivers before he returns.
5. An attempt should be made to maintain the same standards in home deliveries as are maintained in hospital deliveries.

Section III

After Care

Care of patients after delivery should include careful inspection and supervision and every effort to guard against complications.

A. For Mother:

1. Patient should be kept warm in delivery room for at least one hour after delivery, under careful observation.
2. After being returned to a warm bed, patient should be made comfortable, given a warm drink, and kept under observation.
3. Arrangements should be made for the patient to spend at least 9 or 10 days in bed after delivery. Hospital patients should be kept in the hospital 12 or 13 days and arrangements should be made for patients delivered at home to spend an equal length of time resting in bed, after delivery. . . .
4. Adequate diet of well-cooked, nourishing food. . . .
5. Visits by the physician as often as may be needed, and at least on the first, third, fifth, seventh, and tenth days if patient is at home. . . .
6. Nursing care. . . .
7. Patient should be examined by physician at the time of discharge and at four, eight and twelve weeks after delivery for purpose of noting:
 - a) Progress of involution.
 - b) Uterine displacement.
 - c) Anemia, general condition.
 - d) Condition of cervix (speculum examination).

* * * * *

B. For Baby:

1. Thorough physical examination as soon after birth as possible.
2. Medical supervision. . . .
3. Nursing care. . . .

Section IV

Qualifications and Responsibilities of Hospital Personnel

I. MEDICAL PERSONNEL

A. General Considerations:

1. There should be an obstetric staff made up of the chiefs of each service which should have the entire responsibility for the professional care of the patients.
 - a) In general hospitals the obstetric staff should be a division of the regular staff.
 - b) The obstetric staff should be presided over by a chief of staff.
2. The responsibility for the entire obstetric service should rest with the chief of the obstetric service, although it will be necessary for him, acting as director, to delegate certain responsibilities involved in the management of subdivisions of the service.

B. Staff:

1. The chief of the obstetric service
 - a) Should be a licensed registered physician, a specialist in obstetrics, and skilled in all of the operations of his specialty.
 - b) He should be responsible for:
 - (1) The policies and organization of the department.
 - (2) The relationships within the department.
 - (3) Coordination with other hospital divisions.

- (4) Delegation of the responsibilities involved in the management of subdivisions of the service to the physician of the next rank.
 - (5) Establishment of standard technic.
 - (6) Calling of regular staff meetings for discussion of obstetric subjects in general and the analyses of case histories of all cases having unfavorable results.
 - (7) Development of an organized educational program for internes and medical students assigned to the obstetric service.
2. All attending physicians on the Maternity Service should be licensed, registered physicians who have a thorough knowledge of their specialty.
- The attending physician in charge of the antepartum clinic
- a) Should have had postgraduate experience in obstetrics including:
 - (1) An internship in a recognized maternity hospital or a general hospital with a first class maternity service.
 - (2) Experience which has developed teaching ability.
 - (3) An understanding of the policies of the institution and the inter-relationship of the various services.
 - (4) A knowledge of clinic procedures and ability to demonstrate them.
 - b) He should be responsible for:
 - (1) The general direction of the clinic service.
 - (2) Supervision of medical personnel in the clinic.
 - (3) Consultation on abnormal cases in the clinic and on home service (when there is one).
 - (4) Verification of all abnormal measurements.
 - (5) Instruction of internes and students in clinic procedures.
 - (6) Supervision of recording on all histories and records.
 - (7) Supervision and consultation in follow-up of postpartum clinic.
(It is desirable that he have the opportunity of visiting clinic patients delivered in the hospital.)
- The attending physician in charge of the hospital maternity service
- a) Should have had postgraduate experience in obstetrics including:
 - (1) An internship in a recognized maternity hospital.
 - (2) Experience which has developed a thorough theoretical and practical knowledge of normal and complicated cases.
 - (3) Experience in performing versions and instrumental deliveries including all types of instrumentation.
 - (4) Practical experience in care and feeding of newborn infants.
 - b) He should be responsible for:
 - (1) Planning of details of ward routine.
 - (2) Examination of new patients.
 - (3) Supervision of treatment.
 - (4) Supervision of records.
 - (5) The conduct of the delivery service.
 - (6) Instruction of internes and students in delivery room technic and conduct of labor. (Also to be available to give lectures in obstetrics to nurses.)
 - (7) Regular daily visits to postpartum patients in wards.
 - (8) Checking of observations and notations made by the resident or internes.
 - (9) Assignment of responsibility for care of the newborn child, providing constant supervision. (Either through pediatrician or daily visits by doctor in charge of service.)
 - (10) Examination of patients before discharge from hospital.

The attending physician in charge of the outdoor maternity service

a) Should have had postgraduate experience in obstetrics including:

- (1) An internship in a recognized maternity hospital.
- (2) Experience in teaching obstetric technic and procedures.
- (3) A knowledge of the principles of public health and of the available facilities for assistance with care in the home.

b) He is responsible for:

- (1) Conduct of delivery in the home.
- (2) Assignment of cases to internes and students.
- (3) Instruction and supervision of internes and students in home delivery.
- (4) Careful observation of notations on treatment prescribed and service given.
- (5) Arrangement for regular visits to postpartum cases.
- (6) Checking up on final examination of postpartum cases before dismissal.
- (7) Supervision of the baby and where necessary, referring of baby to a private physician, clinic or baby health station.

3. The resident or senior interne on the obstetric service:

a) Must be a regular graduate in medicine from a recognized school and have the following supplementary experience:

- (1) A junior internship on the obstetric service.
- (2) Sufficient instruction and experience under intelligent supervision to give him:
 - (a) Knowledge required for intelligent management of usual cases.
 - (b) Ability to recognize abnormalities or conditions in which he needs assistance.
 - (c) An appreciation of technic and procedures in delivery room and ward service.

b) He should be directly responsible to the doctor in charge of the service to which he is assigned . . .

4. Junior internes.

- a) Must be regular graduates in medicine.
- b) Are responsible to the resident or senior interne . . .

5. Medical students.

- a) Are directly responsible to the resident.
- b) Should be:
 - (1) Present at all deliveries, whether assisting or not.
 - (2) Required to make a careful study of the patients on the obstetric service.
 - (3) Responsible for carrying out minor duties assigned to them by the resident.
 - (4) Allowed to assist at deliveries in accordance with the amount of observation, experience, and ability of the individual student.

II. NURSING PERSONNEL

A. General Considerations:

1. The nursing service should be under the direction of a superintendent or Directress of nurses.
 - a) In hospitals having a school of nursing, this may include both the responsibility for the nursing service and the development of a scheme of instruction and training.
 - b) There should be adequate assistants depending upon the volume of service and the size of the school of nursing.

2. Each institution must of course, make its own division of service which will, in general, be divided between the following groups:
 - a) Assistants responsible for the supervision of the nursing service in the different divisions or departments of the hospital.
 - b) Head nurses.
 - c) Floor duty nurses.
 - d) Students.
 - e) Attendants.

B. Staff:

1. The Directress of the school of nursing or the superintendent of the nursing service must be a graduate, registered nurse. . . .
2. The Nursing Supervisor of the maternity department or hospital must be a graduate registered nurse, well qualified by training in this field.
3. The assistant supervisors or head nurses must be graduate registered nurses with postgraduate experience in maternity work and teaching ability in their own specialty. They should have the following responsibilities:
 - a) Clinic Supervisor.
 - b) Ward Supervisor.
 - c) Delivery Room Supervisor.
 - d) Visiting Nurse Maternity Supervisor.
4. Graduate Nurses assigned to the maternity service should be registered nurses who have had instruction and demonstrations in the policies and techniques of the institution or agency with particular reference to the department in which they are working. They are responsible to the nurse in charge of the service.
5. Student nurses assigned to the maternity service should have:
 - a) Theory in obstetrics and pediatrics either before or concurrently with their practical experience.
 - b) Demonstrations of the accepted procedures and techniques employed by the institution and supervision in carrying them out.
(Student nurses should never carry the responsibility for home deliveries but should always be accompanied by the supervisor or an older staff nurse. The senior nurse should remain with the student until she feels that the case is progressing satisfactorily and it is within the experience of the individual nurse to complete the case with safety to the patient.)
6. Attendants employed or trained in the maternity department of an institution should have:
 - a) Instruction and demonstrations in the procedures and techniques to be employed in care of the patient.
 - b) Regular and careful supervision.

III. SOCIAL SERVICE PERSONNEL

Sufficient personnel should be available to do the social service and follow-up not covered by the nursing personnel.

Section V

Space, Equipment, and Facilities

A. Clinic:

1. Organization.

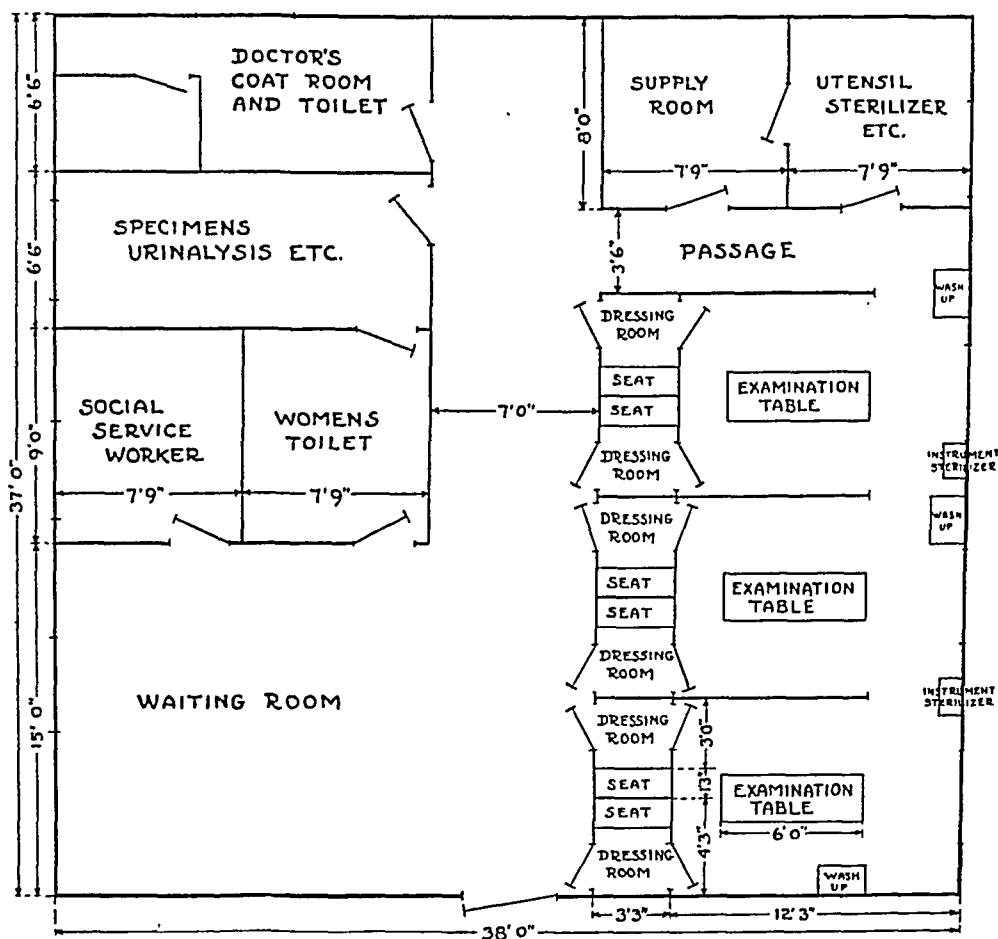
- a) It is desirable that every maternity clinic should be directly connected with a hospital maternity service.
- b) The maternity clinic should either provide for separate sessions for pre-natal and postpartum clinics or refer postpartum patients to the gynecologic clinics.

- c) As far as possible, clinics should be conducted on an appointment basis.
- d) The number of patients should be limited to allow for a thorough physical examination for each new patient and as much time as is needed for examination and treatment of each old patient, depending upon the needs of the individual patient. (Six patients an hour would seem to be the maximum of what one doctor can care for.)

2. Attendance of Staff.

- a) The staff should be assigned definite hours in the clinic and should be required to be prompt in attendance.

FLOOR PLAN PRENATAL CLINIC



- b) A record of attendance should be kept and analyzed periodically. No physician should hold an appointment whose record of attendance is not satisfactory. (Attendance and work should be reviewed at regular staff conferences.)
- c) The medical staff should be relieved as far as possible of all duties not directly concerned with the diagnosis and treatment of patients. Trained assistants for performing the executive, social service nursing, clerical, and technical functions should be provided.

3. Physical Equipment.

- a) A separate waiting room for maternity patients.
Comfortable low chairs (not benches).
Complete teaching exhibit. (With space for group instruction.)
Educational posters on wall.
Toilet room directly connected with the clinic.
- b) Individual dressing cubicles—two for each examining room with mirror, coat hanger, and chair in each.
- c) Examining room or rooms which insure privacy to the patient.

B. Hospital Maternity Service:

- 1. Maternity cases should be confined to a part of the hospital which is physically separated from the rest of the hospital, or preferably a separate building.
- 2. The number of patients admitted for care should be limited to the number that can be adequately cared for. (One hospital bed can provide care for approximately 24 mothers a year; on the basis of 14 days in the hospital for each patient, with consideration for days bed is unavoidably empty.)
- 3. The maternity section should include as a minimum,
 - a) A completely equipped delivery room. . . .
 - b) An auxiliary delivery room should be provided for septic or suspicious cases including . . .
 - c) Labor rooms, where patients may be kept under observation and given individual attention from the time they go into labor until they are ready to be delivered.
 - d) Wards for maternity patients,
Should be as small as possible with a capacity not greater than 12 beds.
The beds should be separated by partitions where possible.
 - e) Nurseries:
 - (1) Well Baby Nursery.
 - (2) Nursery for Premature Babies.
 - (3) Nursery for Isolation.
- 4. Records.
 - a) Record Content:
 - (1) The object of the record is to gather together all available material which will help in the diagnosis and treatment of the patient. It should include all phases of work with or for the patient.*
 - b) Filing Facilities . . .

*Sample Record Forms may be found in the complete booklet.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Selected Abstracts

Toxemias of Pregnancy

Green, John S.: Observations on the Chemistry of Blood and Urine in Toxemias of Pregnancy. *M. J. Australia* 2: 322, 1928.

These observations were made in nineteen months on 304 patients necessitating 3,290 tests, 63 per cent of which were quantitative. The tests included urea concentration, diastatic index, blood urea, nonprotein nitrogen, uric acid, creatinine, diacetic acid, acetone, urobilin, levulose, total nitrogen in the urine, and ammonia and urea in the urine.

The patients were classified as: normal; vomiting; pyelitis; albuminuria of labor, of preeclampsia, of chronic nephritis, or of unknown origin; eclampsia; and hepatic types. While much interest has been attached to the various tests, the most useful at present are the Fouchet, the blood urea and urea concentration. It is believed that a composite picture should be made of the clinical and chemical findings, and when there is a conflict that it is wiser to act on the indication of the former.

From the etiologic point of view, every toxic condition independently of grouping, has potentially three factors: (1) purely toxic (probably hepatic); (2) renal; (3) preexisting nephritis. For practical purposes renal impairment is more significant than hepatic. The author concludes that from the point of view of subsequent history and pregnancy, defective renal tests are very sinister and that this is a consideration in immediate treatment.

H. C. HESSELTINE.

King, G.: The Value of the Levulose Tolerance Test for Hepatic Efficiency in the Diagnosis of Pregnancy Toxemia. *China M. J.* 43: 205, 1929.

In normal nonpregnant individuals the levulose tolerance test gives consistently low curves. The peak of curve is usually reached within half to one hour after commencement of the test, and there is a return to the fasting level at the end of two hours.

In cases of liver disorder, unassociated with pregnancy, marked deviations from this normal reaction occur. A high curve is obtained, the peak is delayed, and there is no return to the fasting level at the end of two hours. Generally speaking these changes vary in intensity with the degree of liver damage, and they are accompanied by an increase in the bilirubin content of the serum.

In normal pregnancy the levulose tolerance curve differs in no way from the normal.

In albuminuria of pregnancy and in nephritic toxemia essentially normal results are obtained, for this type of case is characterized by the preponderance of renal damage with little or no liver damage.

In preeclamptic and eclamptic toxemias abnormal results are found. The various types of curve obtained may indicate anything from a mild liver involvement to an

almost complete suppression of function. When the severe attack has passed, the levulose curve may return to normal, indicating the restoration of liver function. Accompanying alterations in the bilirubin content of the serum may also be demonstrated.

In this group of cases, therefore, the levulose tolerance test has practical value as an aid to diagnosis and as a guiding factor in decision as to the proper treatment.
C. O. MALAND.

Vozza, F.: The Alkaline Reserve of the Blood in Normal and Abnormal Pregnancies. *Ann. di ostet.* 49: 301, 1927.

The alkaline reserve of the blood as measured by the Van Slyke apparatus was found to be reduced in all stages of pregnancy. Its determination seems valuable as diagnostic aid. The reduction was found to be most marked during the first stage of pregnancy and lowest during the second stage, reaching normal about 24 hours after delivery.

There does not always seem to be a direct relationship between the degree of reduction of the alkaline reserve and the clinical picture of a severe toxemia.

In the puerperium of a case having a toxemia, the alkaline reserve becomes normal, much as it does in the normal and appears to do so independent of the toxic symptoms.

In pregnancies complicated with pulmonary infections the acidosis is not greatly increased, in the great majority of cases the alkaline reserve being that of a normal pregnancy. No change occurred in the alkaline reserve when 300 c.c. of a 10 per cent glucose solution was injected subcutaneously or when 5 to 10 units of insulin were given.

JOHN SOUKUP.

Eufinger, H.: Viscero-Sensory Liver Bile Reflexes in Pregnancy. *Arch. f. Gynäk.* 135: 733, 1928.

The author found viscerosensory reflexes of the skin such as described by Head, and Makenzie in 35 per cent of the patients who were examined repeatedly during normal pregnancy. These viscerosensory reflexes were found to correspond to from seventh to tenth dorsal segments, the so-called liver zone. This zone is found in increasing frequency toward the end of pregnancy but disappears during the puerperium. It is found with equal frequency in primiparae and in multiparae. Such findings must, according to the author, be the result of a functional disturbance of the liver and the gall tract, and they increase proportionately with the increase in the bilirubin content of the blood. This reflex is always observed in patients suffering from hyperemesis gravidarum or from icterus. In the toxemias of pregnancy, the reflex is the same as in normal pregnancy. This hyperalgesia apparently does not appear more frequently in patients who present the stigmas of the vegetative nervous system.

RALPH A. REIS.

Eufinger, H. and Bader, C. W.: Liver Function in Pregnancy. I. The Storage of Dyes in Pregnancy. *Arch. f. Gynäk.* 134: 720, 1928.

The authors tested the liver function in pregnancy by injecting, intravenously, 10 to 14 c.c. of a 1 per cent Congo red solution in a series of pregnant women. One hundred determinations were made in normal pregnancy, twelve in patients suffering from hyperemesis, ten in patients with nephrosis, and four in patients with icterus. The storage capacity of the liver for Congo red was found to be decreased during pregnancy and especially during the last months and in labor. This decrease

was more marked when hyperemesis or icterus was present. Their results in the toxicoses of pregnancy such as nephrosis or eclampsia were indefinite. The elimination of the dye depends upon the reticuloendothelial system but more especially upon the chemicophysical structure of the blood. An increase in colloidal instability with low cholesterol blood content always produced a decrease in the dye elimination. The almost constant finding of urobilin in the blood serum and in the urine, and the increase in bilirubin in the blood indicate abnormal liver function throughout pregnancy.

RALPH A. REIS.

Schpoljansky, G. M.: Spasmophilia in Pregnancy. *Arch. f. Gynäk.* 129: 285, 1926.

The author studied seven cases of marked spasmophilia in pregnancy. In three of the cases this spasmophilia was marked by tetany, in three others by severe hyperemesis gravidarum due to a pylorospasm and in the seventh case by bronchial asthma due to a bronchospasm. Spasmophilia is due to an hypofunction of the parathyroids. This leads to a disturbed calcium metabolism and to a localized hypertonicity in the vegetative nervous system, as well as in the peripheral nervous system. Pregnancy is only an exciting cause and lowers the functional capacity of the parathyroids still further, often changing a latent functional insufficiency into an active one. As a result of this hypertonicity, local manifestations may be found producing tetany, hyperemesis, or asthma. The treatment of all forms is causal and antitetanic. The best treatment is the exhibition of calcium in large doses.

RALPH A. REIS.

Hoffmann, A.: The Vegetative Nervous System During Pregnancy, its Functional Disturbances in the Female Sexual Sphere. *Monatschr. f. Geburtsh. u. Gynäk.* 78: 15, 1928.

Pharmacodynamic investigations indicate that the severe reaction produced by atropine is not a sign of increased irritability of the parasympathetic nervous system but on the contrary it is a symptom of diminished tonicity of the latter. In functional disturbances of the female sexual sphere which are dependent upon alterations in the internal secretion of the ovaries, there is a change in the neurotonicity of the vegetative nervous system. The ovarian internal secretion has an inhibitory effect on the sympathetic nervous system. Functional-clinical investigations of the vegetative nervous system during normal pregnancy yield no uniform results, usually; however, there is an increased irritability. During toxemias of pregnancy symptoms such as salivation and vomiting indicate that there is usually an augmented tonicity of the parasympathetic system. Atropine therapy yields good results in these cases. Icterus during gestation may be due to increased pressure in the biliary passages dependent upon a hypertonicity of the parasympathetic system. The successful treatment of such icterus with atropine supports this contention. In pyelitis gravidarum there is an increase in tonicity in the sympathetic system, hence we find atony and dilatation of the ureters in these cases. In alimentary glycosuria during pregnancy there is an increased tonicity of the sympathetic system. In 76.7 per cent of the author's cases he observed an adrenalin glycosuria.

J. P. GREENHILL.

Wodon: Concerning Calcium During Normal and Pathologic Pregnancy with Special Reference to Eclampsia. *Bruxelles-med.* 22: 738, 1928.

Wodon feels that the total calcium content of the maternal blood has no direct bearing on the eclamptic state. Calcium, however, is found in the blood in the ionized state to the amount of about one-fifth of the total calcium. A second fifth

exists as non-ionized calcium bicarbonate while approximately three-fifths of the total calcium exists as an albuminate, which also is non-ionized. The ionic calcium varies normally from 22 to 28 mg. per liter of plasm, and is not necessarily proportional to the amount of total calcium in the body. The author has found that states of shock, narcosis and eclampsia (convulsive state) are characterized by an uncompensated acidosis, and an ionic hypercalcemia while in such conditions as parathyroid and infantile tetany or convulsive and essential epilepsy there exists an uncompensated alkalosis and hypocalcemia.

He concludes that the amount of total calcium in eclamptic women shows no characteristic modification; that only the modifications of ionic calcium concentration in the blood can play a rôle in the eclamptic state; and finally that the convulsions of eclampsia are accompanied by an uncompensated acidosis and a state of ionic hypercalcemia.

THEODORE W. ADAMS.

Wetterdal, P.: Studies of Non-Protein Nitrogen, Uric Acid, and Amino Acids in the Blood of Pregnant and Recently Delivered Women Suffering from Albuminuria, Eclampsism and Eclampsia. Acta Obst. et Gynec. Scandinavica 7: 275, 1928.

The author examined the nonprotein nitrogen, uric acid, and amino acids in the blood of eleven normal, pregnant and recently delivered women and also of 144 patients who had toxemia of pregnancy. Among the latter were 23 cases of eclampsia. As many as six different examinations were made on some of the patients. The author believes that these chemical tests enabled him to differentiate between the cases of pregnancy toxemia and those with nephritis in which there was an increase in the nonprotein nitrogen. The uric acid readings were found to be high in the serious cases at the height of the disease or soon afterward but the nonprotein nitrogen and amino acid determinations had no prognostic significance.

J. P. GREENHILL.

Potter, D. G. E.: Note on the Apparent Absence of Pressor Substances in Eclamptic Serum. J. Obst. & Gynec. Brit. Emp. 35: 743, 1928.

In an effort to determine the cause of the high blood pressure found in cases of eclampsia, through the action of pressor substances, the action of eclamptic blood serum as compared to normal blood serum and histamine-phosphate solution on the isolated guinea pig uterus was studied. In 5 cases of eclampsia no evidence of these pressor substances was found, the normal serum as well as the histamine solutions producing contractions of the uterus in as short, and even shorter periods, as the eclamptic serum.

FRANK SPIELMAN.

Rushmore, Stephen: Eclampsia—A Preliminary Note as to the Cause. New England J. Med. 200: 707, 1929.

The writer suggests that eclampsia is due to calcium deficiency of the mother, owing to the activity of the fetus, which finally affects the liver. Thus is given rise to the well-known disturbances of the carbohydrate metabolism in connection with this severe toxemia of pregnancy. This theory explains satisfactorily most of the characteristic features of eclampsia but fails to account for the liver as primary focus of the disease. "It may be that the liver is particularly susceptible to calcium starvation."

EHRENFEST.

Losee, Joseph R. and Macht, David I.: A Phytopharmacological Study of Eclampsia. Bull. Johns Hopkins Hosp. 46: 3, 1930.

Phytopharmacologic examination of blood sera from a series of eclamptic patients and other severe toxemias of pregnancy fails to reveal any toxic effect on the growth of seedlings of *Lupinus albus*. These findings speak against the presence of a toxin in the blood of eclamptic patients, but do not disprove the presence of other abnormal bodies which are not poisonous for plant protoplasm.

C. O. MALAND.

Johnston, Johnson and Nicholas: Focal Infection in Eclampsia and Further Study of Tyramine as the Etiological Factor of the Toxemia. Texas State J. Med. 25: 515, 1929.

Tyramine was found in two outspoken cases of eclampsia in concentrations of 1.25 mg. and 2.00 mg. per 100 c.c. It was not found in two cases of preeclampsia, nor was it found in a postanesthetic (chloroform) eclampsia. It was present, however (less than 1.00 mg. per 100 c.c.), in a normal seven months' pregnancy, in two men suffering from chronic nephritis (4.20 mg. and 2.00 mg. per 100 c.c.), and in a case of active tuberculosis with an intrapartum infection (1.50 mg. per 100 c.c.). The authors believe that a combination of infection and tyramine intoxication is necessary to produce eclampsia, and that bacterial action on the amino acids produces poisonous amines of which tyramine is the most important. The typical liver lesions of eclampsia were produced in two dogs, the first of which had 880.0 mg. of tyramine intravenously and 440.0 mg. subcutaneously, and the second of which had 400.0 mg. intravenously combined with 10 units of insulin. No convulsions were produced in either case.

WILLIAM F. MENGERT.

Polak, J. O.: Toxemia of Pregnancy. New Orleans Med. & Surg. J. 8: 457, 1929.

Polak classifies the toxemia of pregnancy into two groups, the pernicious vomiting of pregnancy and the preeclamptic toxemias.

In the former the pathology found in the liver and kidneys is a result of retention of toxic products consequent upon the dehydration and glycogen deficiency. In the mild cases of early vomiting of pregnancy revamping of the patients' dietetics and daily hygiene, with special reference to marital abstinence, may suffice to alleviate the condition. In more severe or persistent cases intravenous injections of 1000 c.c. of 10 per cent glucose solution should be administered daily. This failing, transfusions of 300 c.c. of whole blood plus 500 c.c. of physiologic sodium chloride solution may be tried. Absolute isolation is also necessary in these later cases. Polak has not found it necessary to empty a uterus for pernicious vomiting during nearly seven years. However if under treatment properly carried out for one week diuresis is not produced and the vomiting continues the uterus should be emptied.

In the preeclamptic toxemias and eclampsia recent studies point to a dysfunction and improper correlation of the eliminative system and endocrine control as the underlying etiology. Polak feels that the real clinical questions in toxemia are what physical type of woman breaks down under the strain of pregnancy. Thus a woman with a systolic pressure of 150 at the beginning of pregnancy is not likely to go through pregnancy successfully. From a diagnostic standpoint the toxemias may be divided into the hepatic and the renal type though it is often impossible to differentiate the two in the antepartum stage. Treatment may be classified under three main heads: the prevention, the control of the convulsion, and the management of labor in the presence of convulsions. The value of the first is continually emphasized by the great reduction in the occurrence of eclampsia in well-organized prenatal

clinics. Morphine and magnesium sulphate should be used to control the convulsions. All methods of augmenting the excretions such as absolute bed rest, forcing of fluids, low protein diets, etc., should be used in the preeclamptic stage. Finally, in the presence of convulsions the patient should be considered as a medical case and delivery aided only after complete dilatation of the cervix. The management of labor is based on three principles: (1) avoiding trauma; (2) preventing infection; (3) diminishing the shock.

THEODORE W. ADAMS.

King, E. L.: Glucose and Insulin in the Treatment of Vomiting of Pregnancy. J. A. M. A. 86: 1414, 1926.

Seven extremely ill patients were treated with 1000 c.c. of a 5 per cent glucose solution intravenously twice to three times a day with one unit of insulin to about 2.5 gm. of sugar. Two of the seven patients died after having been subjected to this treatment for a period of fourteen and twenty-eight days respectively. The results obtained in the other patients were good. The writer believes that those that benefit by this form of treatment respond promptly and that those who are not markedly improved after a fair trial should be aborted. It is best to resort to the intravenous route when dealing with severe cases. The glucose-insulin method constitutes a definite advance.

GROVER LIESE.

Vogt, E.: Insulin Treatment of the Toxemias of Pregnancy. Klin. Wchnschr. 6: 1339, 1927.

The treatment of the toxemias of pregnancy with insulin is only symptomatic. The use of insulin combined with the administration of dextrose solution, however, is the correct etiologic treatment for all the toxemias of pregnancy and especially for eclampsia. Vogt uses the insulin in amounts varying from 5 to 50 units daily together with a daily liter enema of 5 per cent dextrose solution. In severe cases of hyperemesis gravidarum, the dextrose solution should be given intravenously, the dosage depending upon the amount of acidosis and acetonuria present together with a consideration of body weight and of other factors involved. The combined insulin and glucose treatment of eclampsia is much more rational and more scientific than any other type of treatment now in vogue, including the Stroganoff treatment, which at best is only symptomatic.

RALPH A. REIS.

Sachs, E.: Insulin in the Treatment of Vomiting of Pregnancy. Med. Klin. 23: 556, 1927.

The author has used insulin in cases of hyperemesis and has obtained good results but he does not consider this therapy by any means specific. Women who vomit eat readily and gain weight soon after injections of insulin. To obtain the best results the patients should have a mild hypoglycemia but not sufficient to produce symptoms. For this reason the author does not administer glucose or other carbohydrates at the time insulin is given. Small doses of insulin are used and the author found that not only was the patient's appetite improved but her entire physical appearance.

J. P. GREENHILL.

Pery: On the Employment of Insulin in Hyperemesis Gravidarum. Bull. Soc. d'obst. et de gynec. 17: 45, 1928.

During the past two years the author has employed insulin for pernicious vomiting of pregnancy and since all the patients recovered without obstetric interference, he concludes that insulin is a very valuable drug for these cases.

J. P. GREENHILL.

Levy-Solal, Dalsace, and Cohen-Solal: Vomiting of Pregnancy. Desensitization Therapeusis. *Gynéc. et Obst.* 18: 27, 1928.

The attempt to cause specific desensitization by placental extracts was unsatisfactory, therefore a stable nonspecific albumin (the peptone of Witte) was employed. Eight patients were treated for vomiting of pregnancy by this method. No other therapeusis was used and the possibility of mental suggestion was negatived. The results appear to have been uniformly successful. From this it is concluded that vomiting of pregnancy has its origin in the phenomenon of shock, and is amenable to nonspecific protein therapy.

GOODRICH C. SCHAUFFLER.

Van De Putte: Duodenal Alimentation in the Uncontrollable Vomiting of Pregnancy. *Progrès med.* 11: 1371, 1926.

The author has used the duodenal tube in 6 cases of pernicious vomiting with excellent results, the vomiting clearing up in a very short time. Duodenal feedings and medication were administered by this method. One patient who was relieved of vomiting subsequently died.

GOODRICH C. SCHAUFFLER.

Leven, G.: Radical Cure of Pernicious Vomiting of Pregnancy in All Stages of Pregnancy. *Revue franç. de gynéc. et d'obst.* 23: 645, 1929.

The ordinary nausea and vomiting of early pregnancy and pernicious vomiting are successive stages of the same affliction, dyspepsia, created or aggravated by pregnancy and that this is often complicated by gastric dilatation alone or combined with aerophagy. The dyspepsia is treated by rest in bed, water diet for twenty-four hours, milk diet the next twenty-four hours, followed by the gradual resumption of food. Sodium bromide is given twice daily. Aerophagy is treated by means of the same diet and medication, and also by the addition of bismuth carbonate and soups. Deep breathing exercises are also recommended. For gastric dilatation the same diet and sodium bromide are prescribed but the patient is placed in bed with her hips elevated on pillows. After getting up the patient wears a corset. Constipation and oliguria during the first few days are not combated by the author because he considers these to be physiologic.

J. P. GREENHILL.

Falls, F. H.: Toxemias in Pregnancy. *Illinois M. J.* 46: 292, 1929.

Eclampsyogenic toxemia in the author's opinion is due to a split protein toxin derived from 3 main sources, the endogenous protein metabolism, the exogenous protein metabolism, and from the fetus and its placenta. The level of toxins in the blood is maintained by the ratio of toxins excreted by the system to those derived from the above sources. On the basis of this viewpoint the author's management of cases consists of bed rest and milk diet for every patient whose blood pressure goes up to 140 and who develops albuminuria with casts in the urine. If no improvement occurs pregnancy is terminated.

For hyperremesis gravidarum in which there is a starvation acidosis superimposed upon a state of unstable and abnormal irritability of the sympathetic nervous system and probably a vitamin deficiency, rest, fluids by rectum and hypodermoclysis, sedatives, and glucose intravenously are recommended.

FRANK SPIELMAN.

Mitchell, Ross: The Late Toxemias of Pregnancy. *Canad. M. A. J.* 21: 384, 1929.

The author notes the lack of unanimity in the classification of late toxemias as illustrated by: Cruikshank, Hewitt, and Cooper grouping them into albuminuria,

preeclampsia, nephritic toxemia, and eclampsia; H. J. Stander into eclampsia, preeclampsia, chronic nephritis complicating pregnancy, and eclampsia superimposed upon nephritis; and G. F. Gibbert into chronic nephritis preceding the pregnancy, albuminuria occurring during any one pregnancy, albuminuria occurring during each succeeding pregnancy, and nephritis remaining after each pregnancy. The writer attempts to fuse the above groups for practical purposes into eclampsia, nephritis in pregnancy, and low reserve kidney.

He urges antenatal care for months instead of weeks, as well as postpartum care, in order that the patient may be properly treated and advised. Any pregnant individual with a systolic pressure of 140 or more and albuminuria is considered critically ill.

The summary emphasizes the need for careful and accurate history, examination and record, explanation of prognosis and advice, and eradication of focal infections.

H. C. HESSELTINE.

Schwarz, G.: Blood Pressure and Eclampsia. Arch. f. Gynäk. 135: 133, 1928.

In 95 per cent of 1065 patients there was no increase in blood pressure at the end of pregnancy. During labor there occurs a slight rise during the pains but there is always a drop to normal during the intervals between pains. During the puerperium the blood pressure also remains normal except following postpartum hemorrhage when there is a drop of 10 to 15 mm. The afterpains also produce, as do the labor pains, a slight rise in pressure.

A hypertension, unless due to some intercurrent disease, must always be considered as ominous. Even when no other symptoms are present it must be regarded as a definite preeclampsia. Zangemeister has previously shown that the preeclamptic can be distinguished from other types of hypertension by the fact that in the former there is the definite oscillation of the readings whereas in the latter the readings are constant. The degree of hypertension is never an indication of the degree of danger present, for sometimes a slight but persistent hypertension with occasional periods of marked hypertension is more significant than a persistent and marked hypertension.

With preeclampsia present, extreme care must be taken to avoid any measures which will increase the blood pressure or the intracranial pressure. In most cases of preeclampsia, the blood pressure drops 10 to 15 mm. when the uterus is emptied and returns to normal in 24 hours. In true eclampsia, however, the blood pressure may not return to normal for several weeks. This factor depends upon the number and severity of the convulsions and upon the amount of puerperal bleeding. There is apparently no relationship between the degree of hypertension and the amount of albumin present in the urine, but there is a close relationship between the degree of hypertension, the degree of diminution of urinary excretion and the persistence of the edema.

RALPH A. REIS.

Strassmann, E.: Physiologic Hypertension of Pregnancy. Arch. f. Gynäk. 136: 345, 1929.

Strassmann reviews the literature and reports his findings in 230 pregnant women. Blood-pressure readings were taken from the seventh month of pregnancy through the second month postpartum. No changes in blood pressure were observed in one-half of this group, but in the other half there was a characteristic rise of at least 10 mm. in systolic pressure; in 50 per cent of this second group the rise was over 20 mm. In 30 per cent of this group the blood pressure was 130 or more at term. The author feels that a blood pressure of 150 mm. or less with normal urine findings must be considered physiologic.

The postpartum blood pressure is below normal, being under 110 mm. in 80 per cent, and in 70 per cent the systolic pressure drops more than 20 mm. This typical drop in blood pressure cannot be ascribed to the blood loss of delivery because those patients losing over 500 c.c. of blood during delivery showed no greater drop in pressure than did those who lost less than 500 c.c. The blood pressure readings return to normal in from four to eight weeks postpartum.

The author is of the opinion that this frequently found hypertension must be considered as physiologic and that it is an accommodation phenomenon due to the increased physical and chemical requirements on the part of the pregnant woman.

RALPH A. REIS.

Bárczi: Treatment of the Edemas of Pregnancy, and the Prevention of Eclampsia with Thyroid Extract. Zentralbl. f. Gynäk. 53: 209, 1929.

Congenital lack of adjustment of the glands of internal secretion, and especially of the thyroid is stressed as a causative factor in the production of the toxemias of pregnancy. Thyroid enlargement during pregnancy is assumed to be a protective reaction.

Treatment of the edemas of pregnancy was along the following plan: mild cases, 0.5 gm. thyroid extract daily for three weeks; moderately severe cases, 1.0 gm. daily for one week and then 0.5 gm. for two more weeks; severe cases, treatment continued for five weeks. In 20 cases treated no symptoms of thyroid intoxication were observed. Bed rest and salt-free diet were not used. All labors except one (forceps) terminated spontaneously, and eclampsia did not occur in any.

WILLIAM F. MENGERT.

Klein, W. O.: Ten Years of Eclampsia and Its Treatment. Arch. f. Gynäk. 139: 413, 1930.

During the past ten years there were 162 cases of eclampsia among 7263 deliveries at the Mainz clinic, an incidence of 2.2 per cent. The maternal mortality was 3.7 per cent and the fetal mortality 32 per cent. Of the 162 patients, 82 had convulsions and in this group the maternal mortality was 7.4 per cent and the fetal mortality 30 per cent; 95 patients were delivered spontaneously, 27 were delivered by forceps and 16 by cesarean section. Among the spontaneous deliveries there was no maternal mortality and a fetal mortality of 26.4 per cent. The maternal mortality among the cesarean sections was 6.2 per cent and the fetal mortality 26 per cent. All patients were subjected to rigorous dietary measures, venesection and in addition many were given the Stroganoff treatment. One interesting point revealed by this study is the fact that 22 of the 162 women were suffering from preexisting nephritis.

Klein believes that every case must definitely be individualized. Up until two years ago he followed the middle path of therapy between the radical and conservative types of treatment. Since 1928, under the influence of Stoeckel, the clinic has adopted the active type of treatment for almost all cases and he concludes that every patient with convulsions must be delivered immediately. The method of delivery chosen depends upon the conditions present, either by forceps or cesarean section irrespective of the fact that the fetus may be alive or dead. Patients with threatened convulsions should be treated by venesection, rest, diuresis and diet. All patients must, of course, be under constant and careful observation and a most rigid dietary control.

RALPH A. REIS.

Clason, S.: The Results of Eclampsia and Eclampsismus in the Karolinian Institute in Stockholm for 1920-1927. *Acta Obst. et Gynec. Scandinavica* 8: 43, 1928.

This study supplements a similar one made in 1921. During the years 1913-19, the treatment of eclampsia was expectant and among 102 cases the maternal mortality was 10.8 per cent. During the years 1920-27 the treatment of this condition was the Stronganoff-Zweifel one, and among 125 cases, the mortality was 5.6 per cent. The total maternal mortality for the entire series from 1913 to 1927 was 7.7 per cent, the total fetal mortality 24.4 per cent.

In the author's clinic, pregnancy is interrupted when the symptoms become worse in spite of medical treatment.

J. P. GREENHILL.

Waldstein, Edmund: Therapy of Eclampsia. *Zentralbl. f. Gynäk.* 51: 1757, 1927.

At the Frauen Hospiz in Vienna, 117 cases of eclampsia, of which 11 were antepartum, 61 subpartum, 45 postpartum, were treated resulting in only two deaths. One patient died after the 89th convulsion, being delivered by cesarean section after the seventh convulsion; the other succumbed to an aspiration pneumonia.

Early delivery, which was accomplished on an average of two and one-half hours after the first convulsion, is held responsible for the extraordinarily low mortality of this series. Extensive use of cesarean section was made when convulsions occurred antepartum or at the very onset of labor. Forceps, version and extraction were freely employed to terminate advanced labor. No death has occurred in the last 69 cases. To a certain degree the number of convulsions before delivery determines the number occurring after delivery, therefore, delivery should be accomplished as soon as possible after the first convulsion. The delivery was often followed by a venesection and infusion of saline solution. The use of morphine to control the convulsions has been entirely substituted by 0.3 gr. of luminal, never more than 3 times in twenty-four hours.

GROVER LIESE.

Fueth, R.: A Case of Eclampsia in Early Pregnancy. *Arch. f. Gynäk.* 133: 40, 1928.

This is a report of a case of fatal eclampsia occurring during the fourth month of pregnancy. The patient, a twenty-two-year-old primipara, suddenly fainted and was admitted to the clinic with the provisional diagnosis of acute appendicitis. She was drowsy, apathetic, and complained of abdominal pain. A slight vaginal bleeding aroused the suspicion of a criminal abortion. Soon after admission she had a severe vaginal hemorrhage which necessitated a manual emptying of the uterus. The patient then had several epileptiform seizures with loss of sphincter control, became more and more stuporous and died in five hours just after a bilateral renal decapsulation. Autopsy showed no gross lesions of brain tissue and only slight changes in the liver and kidneys. Fueth discusses the 55 cases of eclampsia early in pregnancy which he found in the literature.

RALPH A. REIS.

Laffont, A., and Larribère, J.: The Treatment of Eclampsia by Somnifène. Cure and Continuation of Pregnancy. *Rev. franç. de gynéc. et d'obst.* 24: 148, 1929.

In the literature are reports of 81 cases where pregnancy continued after the cure of eclampsia. However, among these cases only 23 children were born alive. Hence in most of the cases the convulsions caused the death of the fetus which was subsequently expelled. It is logical to assume that the fetal death in these cases contributed to the cure of the eclampsia just as a cure results after delivery of a baby.

Among the 23 instances where live children were born, labor occurred after forty-eight hours in 2 cases, after three days in 1 case and after four days in 4 cases. Hence there were only 14 cases where gestation continued more than four days after the last convulsion.

The authors treated eight eclamptic patients with somnifène. Two patients were treated postpartum, three during labor and in one case labor began a few hours after the injection of somnifène. Of the two patients treated during pregnancy, one did not go into labor until nineteen days after treatment and the other thirty-four days later. Both children were born alive. Hence, the authors conclude, these two cases were actually cured of eclampsia during pregnancy.

J. P. GREENHILL.

✓ Laffont and Jahier: One Hundred and Forty-Three Cases of Eclampsia Observed at the Algerian Maternity. *Bull. Soc. d'obst. et de gynéc.* 17: 579, 1928.

Since 1918 the number of cases has increased considerably. Until recently eclampsia was very uncommon among the natives of North Africa but in 1927, 6 of the 13 eclamptic patients were natives. The author believes that the great frequency of syphilis is responsible for these cases of eclampsia. He found a large incidence of syphilis among all the patients with toxemia. In spite of the increase in the number of patients with eclampsia, there has been a decrease in both maternal and fetal mortality. In the treatment the author relies upon profuse gastric and intestinal lavages, drastic purgation and venesection. If the woman is in labor she is rapidly delivered by incisions in the cervix and vaginal cesarean section, if necessary. If the patient is not in labor and medical treatment does not produce a rapid improvement, abdominal cesarean section is performed after the seventh month and vaginal hysterotomy before this period.

J. P. GREENHILL.

Peckham, C. H.: Chronic Nephritis Following Eclampsia. *Bull. Johns Hopkins Hosp.* 45: 176, 1929.

A surprisingly large percentage of eclamptic women are found to have definite though relatively mild chronic nephritis a year or more after the attack. Much more nephritis follows severe than mild eclampsia, and it is more likely to develop after the antepartum type. The latter is particularly true when the eclampsia develops at some time before the pregnancy has reached term.

Out of 5 cases of repeated eclampsia, nephritis developed in 3 after the second attack. None of these patients gave a history indicative of chronic kidney disease prior to the convulsive attack. There appears to be no connection between the number of convulsions and subsequent nephritis. However, it develops relatively less frequently when the duration of the convulsive attack is under six hours. There seems to be a direct relation between the amount of hypertension with albuminuria and later permanently impaired kidneys. With a pressure of 200 or more and albuminuria of at least 10 grams, three-quarters of the patients ultimately develop nephritis.

The blood chemistry at the time of eclampsia gives no indication of what may develop later.

A slow return of blood pressure to normal is suggestive. However, nephritis may develop within the year, even in patients who were discharged with normal pressure and negative urine. On the other hand, hypertension and albuminuria persisting throughout the puerperium do not necessarily indicate that the kidneys will sustain permanent damage. The outlook for a subsequent pregnancy following eclampsia is less favorable than is generally believed.

Even the most adequate prenatal care will not always prevent eclampsia. Consequently, all toxemias should be carefully watched since even the mildest types may occasionally eventuate in an altogether unexpected eclamptic attack.

C. O. MALAND.

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CHORIOEPITHELIOMA

WITH ESPECIAL REFERENCE TO DISAPPEARANCE OF THE PRIMARY
UTERINE TUMOR

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Medical School)*

NO GROUP of tumors presents more interesting problems of pathologic diagnosis than do those arising from the chorionic epithelium. Some are obviously benign, others frankly malignant, but between these two extremes are other forms which it is difficult to evaluate from the standpoint of malignancy or nonmalignancy. Errors in diagnosis are perhaps more common in this field than in any other in gynecologic pathology.

There are several reasons for the difficulties in diagnosis presented by these tumors. Most important, perhaps, is the fact that the trophoblast is a normally invasive tissue. Even in normal pregnancy the uterine musculature is commonly invaded to a considerable depth, especially below the placental site, by chorionic wandering cells. Moreover, masses of trophoblastic tissue, and even clumps of chorionic villi, may be found in the veins of the uterine wall, or, for that matter, they may be deported to distant fields, more particularly the lungs. Schmorl's well-known studies¹ on this point indicate that such trophoblastic pulmonary emboli occur in at least 80 per cent of women during normal pregnancy. This capacity of normal trophoblast for what may be called physiologic metastasis, and its normal invasiveness, are

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not very dissimilar from the well-known characteristics of cancer tissue, and help to increase the difficulties in the differential diagnosis of trophoblastic tumors.

Again, there is often comparatively little difference in the constituent elements of normal trophoblast, benign chorionic tumors, and the malignant chorioepitheliomas—certainly less than in the corresponding gradations of growths arising from other epithelial tissues. The diagnosis of malignancy must therefore take into consideration, perhaps more than elsewhere, such considerations as quantity of proliferative overgrowth, degree of invasiveness, etc. The factor of "capacity for independent growth," which Ewing so strongly stresses, is difficult to demonstrate by the microscope. Its biologic importance is obviously important, but its utilization in practical diagnosis is not clear.

In frankly malignant cases it is true that the constituent trophoblastic elements, more particularly those derived from the Langhans layer, show a more or less marked degree of anaplasia, with nuclear changes like those characterizing cancer cells in general. In the main, however, one is apt to derive less assistance from this criterion with chorionatous tumors than with most others.

It is easy to see, therefore, why mistakes in this particular field of pathologic diagnosis are so readily made, and the value of statistics collected from the literature must be discounted to this extent. When one considers that even normal placental remnants left in the uterus after miscarriage or full-term delivery have not infrequently led to the erroneous diagnosis of chorioepithelioma, one can understand differences of opinion in the interpretation of some of the more difficult pictures encountered.

Various attempts at the classification of the chorionic epithelial tumors have been made. The earliest of these, still not infrequently employed, was that proposed by Marchand² in 1895. This writer, whose classic work placed our knowledge of chorionic tumors upon a sound footing, recognized two main groups, a typical and an atypical. The first of these consists of tumors containing both types of trophoblastic tissue, the Langhans cells often predominating over the syncytium. The atypical variety, on the other hand, is composed of syncytium alone, and clinically it is characterized by a far lesser degree of malignancy.

One of the most pretentious efforts at classification is that of Ewing.³ This takes no cognizance of a benign group, although it is at least a question as to whether the benign hydatidiform mole should not be considered as a definite neoplasm. Many, of course, consider it a degenerative lesion, accenting particularly the hydropic changes in the villous stroma and the scantiness or disappearance of the villous blood vessels. But the trophoblastic proliferation is almost as con-

stant, and probably more characteristic. Individual villi in many hydatidiform moles often show little trophoblastic overgrowth, but this, in our experience, is often due to the fact that such villi are merely degenerated or regressive, because they are not in contiguity with the nutrient uterine wall. For that matter, they have often been cast off into the cavity of the uterus.

The study of hydatidiform mole in situ, so to speak, is apt to show a very different picture. Marked overgrowth of the trophoblast is commonly observed, so that it is easy to see how sections of such uteri could be mistaken for chorioepithelioma. For such reasons it is difficult to accept Ewing's view that "the differential diagnosis between a benign and a malignant hydatid mole usually presents no difficulty." This is especially true if one recognizes malignant mole as a definite entity, as Ewing does, giving it the name of chorioadenoma destruens. The wisdom of this is not clear, for the malignant mole metastasizes, recurs, infiltrates, and kills just as does the so-called chorioepithelioma, though not to the same degree. It is a malignant epithelial growth, and is better interpreted, it seems to us, as of carcinomatous nature, i.e., as a type of chorioepithelioma. The question involved is the same as that of the so-called "malignant adenoma," which, after all, is only a type or grade of adenocarcinoma, whether we label it malignant adenoma, Grade I adenocarcinoma, or what not.

The classification suggested by Ewing has not been accepted by gynecologists with any great enthusiasm; but, aside from such minor considerations as appropriateness of terms, we believe it to be in most respects a very sound one. We have already mentioned the fact that there is good reason to include the benign chorioma, i.e., the benign hydatidiform mole, in any scheme of classification of chorionic neoplasms. Mention, too, has already been made of the real difficulty which, in contrast to Ewing's view, is at times experienced in differentiating a perfectly benign mole—if one may judge from its clinical course—from his so-called "chorioadenoma destruens," if, as is often the case, the hydatidiform mole is characterized by marked trophoblastic proliferation with considerable penetration of the uterine musculature and vessels.

The aptness of the designation "chorioadenoma" appears unconvincing, in spite of Ewing's just contention that the villi possess many of the characteristics of glands. Morphologically, however, the villi themselves differ so much from glands, and the tumors arising from them have so little in common with adenomas as far as microscopic appearance is concerned, that the choice of the term "chorioadenoma destruens" for one group seems not such a happy one. Even the designation of "choriopapilloma," which Ewing mentions only to discard, would seem to be a better one. In other words, the function

of the parent tissue would seem a less logical basis for classification than the pathologic structure.

This, perhaps, is a less important question than that of whether this particular type of malignant chorioma should be divided as sharply as it has been by Ewing from the actual chorioepithelioma, even though its malignancy is definitely less. Would it not be better to class all the definitely malignant tumors as chorioepithelioma, and then to recognize the fact that, like other malignant epithelial tumors, various gradations of malignancy are encountered?

It is on such grounds as this that the view was urged by one of us (Novak)⁴ in a previous paper that the simplest division of these choriomatous tumors is into (1) chorioma benignum, corresponding to the benign hydatidiform mole; and (2) chorioma malignum or chorioepithelioma. The latter group, in other words, would include both the chorioadenoma destruens (the destructive placental mole) and the chorioepithelioma of Ewing. The subdivision into the two latter types is of value, just as is the subdivision of carcinomas in general into types and grades according to the degree of malignancy, so long as their fundamental unity is recognized.

As stated above, we do not believe that the differentiation of the benign from the malignant mole is always easy if one is dealing with sections of the uterine wall. In actual pathologic practice, of course, one is often helped immensely by the clinical history of the case. If a large mass of grape-like vesicles has been expelled or evacuated from the uterus, one is strongly inclined to interpret otherwise doubtful pictures as probably benign, because there is, in the malignant growths, a strong tendency to destruction of the villous pattern. This is, of course, far from an infallible criterion, but it has its value. As emphasized in Novak's previous paper, there is much reason to believe that many cases reported in the literature as chorioepithelioma have really been benign moles with abundant trophoblastic proliferation. After all, the differentiation must in some cases be based largely upon the amount of proliferation and the degree of invasiveness and destructiveness of a tissue which in itself may not differ so much, whether we are dealing with normal pregnancy, benign or malignant mole, or chorioepithelioma. When the trophoblast invades the uterine wall en masse, with extensive necrosis of the musculature, there is little doubt of malignancy. But when the villi are well preserved though perhaps gigantic, and necrosis and invasion not conspicuous, even extensive trophoblastic overgrowth is not in itself indicative of malignancy.

The third type of chorioma distinguished by Ewing, the "syncytioma and syncytial endometritis" likewise will not commend itself to gynecologists as a clear-cut neoplastic entity, certainly in so far as "syncytial endometritis" is concerned. The characteristics of the latter are those

commonly encountered in the inflammatory lesions following miscarriage or delivery. These are most often associated clinically with bleeding, and are produced by the retention of gestation products in the uterus. Villi are not infrequently found, but in addition there is often extensive infiltration of the uterine wall with syncytial cells. The picture, however, suggests an inflammatory process far more than a neoplastic one.

It is not the purpose of this paper to discuss the pathologic condition or the clinical characteristics of chorioepithelioma, but to call attention to one or two of the vagaries which distinguish it from other tumors. One of these, quite well known, is the fact that, while ordinarily it is an extremely malignant tumor, there are certain cases, approximately 10 per cent, which run a favorable course, with either spontaneous cure or cure after very incomplete operation. Another is the fact that in a rather considerable number of cases, in which extensive metastasis has occurred, no trace of the original tumor could be found. A third peculiarity is the fact that chorioepithelioma, as well as its benign prototype, is often associated with a rather characteristic group of changes in the ovaries. It is the second of these peculiarities with which we shall chiefly concern ourselves.

In 1902, Zagorjanski-Kissel⁵ collected nine cases of chorioepithelioma in which there was no primary tumor in the uterus. In eight of these there was a presumably primary tumor in the vaginal wall, and in one there were growths in the lungs and brain. A considerable number of these cases of so-called ectopic chorioepithelioma have been reported since then. De Zalka⁶ has recently collected a considerable group, and has added one of his own, in which there were tumor nodules in the left ovary, liver, lungs, and other organs, without a primary tumor in the uterus. The question at once arises as to whether such a primary origin in the uterus can be assumed, in view of the fact that chorioepitheliomatous growths have not infrequently been found entirely apart from pregnancy.

The first case of the latter type was reported by Kanthack and Eden⁷ in 1897. A considerable number of chorioepitheliomatous tumors of the male testis have of course been reported, and de Zalka was able to find in the literature some twenty-five cases of primary chorioepithelioma of the ovary, a much less frequent site. A rather questionable case of chorioepithelioma of the uterus, without preceding pregnancy, was reported by Lubarsch,⁸ while Bock⁹ has recorded an instance, which must also be regarded with skepticism, of a typical hydatidiform mole in a virgin twelve and a half years old.

Chorioepitheliomatous elements have not infrequently been found in dermoids in various locations (ovary, testis, anterior mediastinum, etc.), and Teacher,¹⁰ with considerable plausibility, believes that chorioepitheliomatous tumors found apart from pregnancy are teratomas "arising from some structure which has the morphologic value of an included ovum, and that the chorioepitheliomatous elements represent the actual trophoblast of the included ovum."

A case of the type reported by de Zalka, and representing the group with which we are now more directly concerned, was observed by Selmorl.¹¹ A primary vaginal tumor appeared eighteen weeks after a normal delivery. No evidence of involvement of the uterus, tubes, or ovaries was to be found. The patient died six months after her confinement, with metastases in the lungs, liver, intestines, and kidneys. In the

rather considerable series of cases of chorioepithelioma recently reported by Meyer,¹² Cases 7 and 8 are of this same type. In Case 7, in which a hydatidiform mole had been expelled, the patient was curetted for uterine bleeding some days later, on May 10. Bleeding reappeared at the middle of June, at which time a reddish-blue ulcerated nodule was excised from the anterior lip of the cervix. This proved to be a definite chorioepithelioma, so that hysterectomy was done. No trace, however, of hydatidiform mole or chorioepithelioma was found either in the curettings or in the uterus. The patient was well two and a half years after operation. Meyer interprets this case as probably one of ectopic chorioepithelioma, because the hysterectomy was done so soon after the expulsion of the mole, and yet no trace of chorioepithelioma was found in the uterus. This reasoning is, of course, not conclusive.

Case 8, in Meyer's series, was even more characteristic of this group. The patient expelled a hydatidiform mole on February 4, and was curetted on February 25 for bleeding. On February 27 bleeding occurred from a nodule in the vagina, and on March 2 the patient again entered the clinic. There was free bleeding from a friable nodule, about the size of a walnut, in the posterior fornix of the vagina. Histologic examination of this nodule showed chorioepithelioma. The patient died on March 19 of a streptococcus infection, present on admission. At the postmortem examination no trace of chorioepithelioma, either macroscopic or microscopic, could be found in the uterus, although a few scattered chorionic wandering cells were found in the uterine wall. Other cases of this general type have been reported by Krewer,¹³ Geist¹⁴ and others.

A case observed by Dr. Frank C. Marino, of Baltimore, who kindly turned the pathologic material over to us for study, was of this general type, though not so conclusive. About six months after an operation for pregnancy in a ruptured right tube, the patient was returned to the hospital, her condition suggesting a severe abdominal hemorrhage, presumably from a ruptured pregnant tube on the other side. The tube and the ovaries, both of which had been conserved at the first operation, were found to be normal. The blood filling the abdomen apparently had its source from numerous hemorrhagic growths scattered over the peritoneum. They varied in size from that of "a pea to that of a twenty-five cent piece," and were especially numerous over the ileum, omentum, and bladder. The hemorrhage from the intestinal implantations was so profuse that twelve inches of bowel had to be resected. In spite of blood transfusions the patient died after ten days, presumably because of progressive abdominal hemorrhage. The microscopic study of the implantations shows them to be typical chorioepitheliomas. Unfortunately the specimen of the original tubal gestation was no longer available for study, although it is said to have given no gross suggestion of malignancy.

Corresponding to the cases in which there has been a disappearance of a primary growth in the uterus, a group has been reported by various observers of corresponding disappearance of primary testicular tumors in the presence of extensive chorioepitheliomatous metastasis. A good illustration is furnished by the instance recently reported by Prym,¹⁵ whose patient at postmortem showed extensive metastases in the retroperitoneal glands, kidneys, lungs, liver, and elsewhere. No trace of active tumor tissue was found in the testis, although a cicatrized area marked its site, and the history indicated a definite tumor had been present. It will be noted that the distribution of metastases in these testicular cases is essentially the same as that associated with growths primary in the uterus.

The cases which have been mentioned, and which are based on careful microscopic studies, appear to establish the possibility of disappearance of the primary tumor as beyond reasonable doubt. A recent

case of our own, we believe, fortifies this assumption, especially as the original presence of the primary tumor was demonstrable in the curettage done some months before the patient died of extensive metastases.

CASE REPORT

The patient was a white woman, thirty-one years old, who was admitted to the hospital on November 13 with a history of headaches and increasing loss of vision for several months previously. She had had four children. There was nothing of note in her previous history until a few months before her admission to the hospital. Beginning in April, 1928, there had been slight bleeding about every two weeks. Normal menstruation occurred on June 16, lasting three days, and on July 13, when a curettage was performed at another hospital. Numerous small bits of tissue were brought away, although they did not, according to the report of the surgeon, suggest placental tissue. The pathologic report, after microscopic



Fig. 1.—Curettings from case reported in paper, showing masses of trophoblastic tissue (both Langhans cells and syncytium), with no chorionic villi.

examination, was "Retained tissue following abortion." The slide upon which this diagnosis was based was kindly turned over to us, although the original curettings were not available. This slide will be discussed later.

The examination after admission to the Johns Hopkins Hospital showed bilateral choked discs, right homonymous hemianopsia and increased deep reflexes on the right side. Without going into details, a brain tumor was diagnosed, and operation done by Dr. Walter Dandy on November 17, a left occipital lobe tumor being removed. Death occurred on November 19. The tumor proved to be a typical chorioepitheliomatous metastasis.

The postmortem examination (Dr. Koff), in addition to the ragged cavity (about 10 cm.) in the left occipital lobe, from which the tumor had been removed, revealed also a number of chorioepitheliomatous nodules in the lungs and kidneys, as demonstrated by microscopic examination.

Special interest, of course, attaches to the findings in the generative organs. The uterus was of normal size. On opening it, the endometrium appeared somewhat congested, and at one point of the posterior wall, there was a small sessile

thickening which appeared more hemorrhagic than the remainder of the mucosa. There was a small amount of bloody discharge in the uterine cavity and also in the vaginal canal. The cervix was normal, except for a small erosion.

The left ovary was only slightly above normal size, and on section showed no abnormalities except a considerable number of tiny cysts, none larger than 1 cm. Some were filled with clear, and some with hemorrhagic fluid. The right ovary

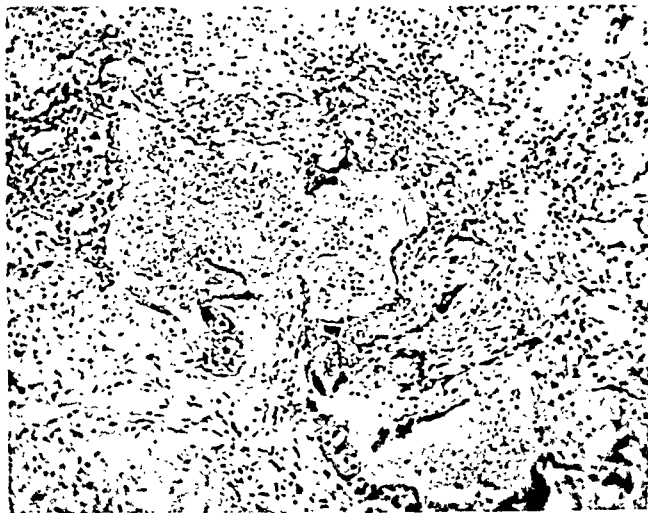


Fig. 2.—Section from lung metastasis, showing typical picture of chorioepithelioma.

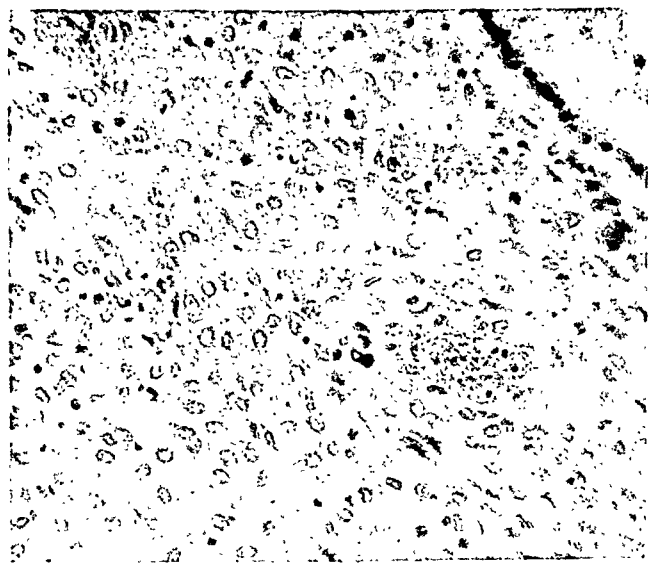


Fig. 3.—Section of endometrium, showing a persistence of decidua reaction in a few areas.

was about twice normal size, chiefly due to the presence of a thin-walled cyst measuring 2 cm. in diameter. Its wall was of greyish yellow hue, and the contained fluid was distinctly hemorrhagic. In addition this ovary contained a normal appearing corpus luteum, apparently in the stage of beginning retrogression, together with numerous small cysts similar to those found in the left ovary. The tubes were normal.

The microscopic examination of the tumor areas in the brain and lungs showed typical chorioepithelioma, with irregular masses of both syncytial and Langhans cells, much hemorrhage, and considerable coagulation necrosis.

Numerous sections made from the uterine wall failed to show any evidence of chorioepithelioma, or, indeed, of any trophoblastic tissue at all. There was much hemorrhagic infiltration of the uterine mucosa in the slightly raised hemorrhagic area described in the gross examination, and a moderate inflammatory infiltration was seen, but no villi or chorionic epithelium could be found. At some points there was still seen a definite decidual reaction in the stroma, but in most cases the stroma gave no suggestion of the preceding pregnancy. The persistence of this decidual reaction so long after the original pregnancy is of much interest. Certainly it would hardly be expected after the termination of a normal pregnancy, either by abortion or full-time labor. The natural assumption is that the persistence of this decidual reaction may be due to the fact that, although there is no trophoblast in the uterus, there is an abundance of this tissue in the metastases present in other organs, more particularly the brain and the lungs.

The microscopic study of the ovaries was of especial interest because it revealed a moderate degree of the multiple lutein cystic change so characteristically associated with chorioepithelioma or hydatidiform mole. Many of the small cysts shown on section of the ovary proved to be atretic follicles, most of which showed a complete absence of the granulosa, and no especial thecal change. A number of the smaller cysts, however, showed a striking lutein change in the theca interna. In addition to this, there was a larger cyst lined by a typical lutein layer, evidently of granulosal origin, together with a large, but regressive corpus luteum.

COMMENT

In cases of chorioepithelioma in which, in spite of extensive metastasis, the primary uterine growth appears to have disappeared, three possible explanations suggest themselves. In the first place, one might ask, especially in cases in which no definite history of pregnancy can be obtained, whether the uterus is actually the point of origin, and whether the distant growths are not really of teratomatous nature. As far as our own case is concerned, this view is untenable for various reasons, but chiefly because of the definite history of a recent pregnancy, and even more because the curettings at the original operation showed what was apparently a definite chorioepithelioma.

Only one slide was available for study, and this showed only a few fragments of tissue. No villi were seen. The trophoblastic masses consisted of both syncytium and Langhans cells, and the latter especially presented such definitely malignant characteristics as mitoses, hyperchromatosis, etc. Certainly there can be little doubt of the diagnosis of chorioepithelioma, especially in view of the later history.

Generally speaking, the diagnosis of chorioepithelioma from curettings is a hazardous procedure, for reasons which are evident from the foregoing discussion. In certain cases, however, where large masses of trophoblastic tissue, without villi, are brought away by the curette, and where the microscope reveals unquestionable evidence of cell anaplasia, there is little possibility of error in the diagnosis of malignant chorioma. Even with smaller bits of tissue, as in our case, there would

be good reason for the diagnosis, although it is easy to see how malignancy could be overlooked in the ordinary routine examination. In our case, the diagnosis, as we have described, was made in the retrospect, i.e., after the death of the patient from metastases.

A second viewpoint which has been urged in the explanation of cases of the type we are discussing is that the chorioepitheliomatous growths in such distant organs as the lungs may arise from malignant degeneration of trophoblastic emboli even when the placenta itself shows no malignancy. This view is obviously rather difficult to establish, because of the difficulty of excluding small localized areas of chorioepithelioma in the placenta, for these can easily be overlooked or missed even on careful examination. Theoretically, there would seem to be no reason, however, why trophoblastic emboli carried to distant organs might not in some cases undergo malignant degeneration. In our own case, and for the reason already mentioned, this explanation would appear untenable.

The logical explanation of our own case would be that the uterine chorioepithelioma was the primary lesion, and that, although the metastases ultimately killed the patient, the primary lesion had disappeared. How great a part the curetting played in this, it is difficult to say. Most authors are inclined to doubt the possibility of removal of chorioepithelioma by the curette, because of the depth of involvement of the uterine wall, even in early stages. And yet, these tumors differ so much in their malignancy that it is hard to be dogmatic on this point. The unknown factor of local and general resistance must be considered, for certainly even complete recovery has occurred in not a few cases after very incomplete operation for chorioepithelioma of undoubted authenticity. For that matter, of course, even the possibility of spontaneous cure is admitted by all writers. In our own patient, moreover, the uterine lesion, at the time of the curetting, must have been quite early, for only a small amount of tissue was obtained and the uterine wall was described as being quite firm.

On the other hand, the fact remains that cases with otherwise similar courses have been observed in which no curetting was done, and that an analogous disappearance of a primary testicular tumor has often been observed with chorioepithelioma in the male. If it were possible to explain such occurrences, a great step would have been made in our study of tumors in general. Indeed, no tumor offers such inviting problems from this standpoint as does chorioepithelioma.

COMMENT ON OVARIAN CHANGES

. As far back as 1898 Marchand called attention to the frequent association, with hydatidiform mole or chorioepithelioma, of multiple lutein cysts—or, as they were originally considered—multiple corpus luteum cysts. The frequency of this association is given variously by

different authors. Runge¹⁶ found such ovarian cystic changes in thirty-nine of sixty-three cases of hydatidiform mole, while others report a much lower incidence. These differences are partly explained by the fact that the ovarian changes vary greatly in degree, and that, in some instances, the ovaries show scarcely any microscopic enlargement, even though very characteristic changes are revealed by microscopic study. Unless the ovaries are actually removed at operation or postmortem, therefore, one is scarcely justified in assuming an absence of the characteristic changes even though careful bimanual examination shows no ovarian enlargement or tumor. The present-day prevalence of the conservative treatment of hydatidiform moles, therefore, does not lend itself to an accumulation of material for this sort of study.

Again, there can be little doubt that the incidence of this peculiar polycystic ovarian lesion depends a great deal upon the age or duration of the hydatidiform mole or chorioepithelioma, as urged by Schröder. It is quite possible, indeed, very probable, that at some time or other, and to some degree or other, this lesion occurs constantly in the course of either benign or malignant chorionatous disease. A number of authors, for example, are inclined to the belief that large cysts develop only after expulsion of the mole, but this view, supported though it seems to be by a number of observations, is not universally accepted.

The size of the ovarian tumors, as already mentioned, is very variable. In some cases they may be as large as a man's head, in others the ovaries show little or no gross enlargement. The same variation is seen in the size of the individual cysts.

The two questions which have excited most discussion with reference to these tumors, are (1) their significance in relation to the intra-uterine disease; and (2) the origin of the lutein cells lining the cysts. Both of these questions will be discussed in a later paper by the present authors, based upon a somewhat larger amount of material. There can be little doubt that the ovarian lesion is secondary to the chorionic disease, and not, as many have believed, vice versa. The study of the present case, moreover, suggests that the abnormal trophoblastic overgrowth in the uterus may excite lutein-like transformation in both granulosa and theca interna. For example, in some follicles the granulosa is intact and shows no lutein transformation, while the thecal cells have undergone marked lutein cell metaplasia. The thecal origin of lutein cells is again indicated by the occurrence of masses of lutein cells deep in the walls of atretic follicles and even of old corpora fibrosa. On the other hand, one may find definite lutein strata, which, from their position and relation to other structures, such as the so-called "glashaut," certainly suggest a granulosal origin. This whole question, however, together with a review of the literature, will be reserved for another paper.

SUMMARY

After a discussion of the classification of choriomatous tumors, this paper is devoted to a consideration of the disappearance of the primary uterine tumor in cases of chorioepithelioma. A case is reported in which such a disappearance was noted, although the patient later died of extensive metastases in the brain and lungs. That there was an original primary tumor in the uterus was proved by examination of the uterine curettings several months before the patient's death. Autopsy showed no trace of chorionic tissue in the uterus. Other cases of this type which have been reported are reviewed, and the various explanations discussed. The autopsy showed the ovaries to be the seat of characteristic hyperlutein changes, and gave an opportunity of studying the histology of the pituitary body in relation to these changes. The discussion of these ovarian and pituitary changes is reserved for a second paper.

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26 EAST PRESTON STREET.

Rickman, J.: On the Etiology of Prolapse of the Uterus. J. Obst. & Gynec. Brit. Emp. 36: 70, 1929.

The author attempts to correlate the various factors entering into the etiology of prolapse, by using a formula capable of universal application in medicine, i.e.

A predisposing factor: Constitutional.

A specific factor: Increased intrapelvic pressure.

Contributory factors: Including a variety of phenomena themselves requiring subdivision and classification.

Inciting Causes: For example, a fall.

He favors this formula because it coordinates factors not previously linked, adds a notion of quantity to the factors contributing to the etiology, and lays more stress on defects of function than on anatomy.

FRANK SPIELMAN.

THE BLOOD-PLATELETS IN PREGNANCY AND IN THE PUERPERIUM

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IN SEVERAL recent papers^{1, 2, 3} dealing with the morphology of the blood in pregnant women, it was shown that a moderate to a severe grade of secondary anemia and a rapid sedimentation rate are usually present. The deficiency of the blood is early overcome after labor without special treatment, and the sedimentation rate returns to normal within two to six months after delivery.

In a further study of the blood in pregnancy, we have made determinations of the number of platelets (thrombocytes) in pregnancy and in the puerperium. This investigation was undertaken because comparatively little is known of the behavior of the platelets in pregnancy, and because of the important relation these elements are thought to bear to blood clotting. It was hoped that this study would throw some light on the coagulability of the blood in pregnant women.

It is definitely known that the process of coagulation is dependent on three essential elements: the blood-platelets, fibrinogen, and calcium salts. Modern theories in general agree that fibrin is formed by the action of thrombin on fibrinogen. Intravascular clotting does not occur because thrombin exists only in its inactive form of prothrombin. Morawitz (1904)⁴ believes that in shed blood a coagulating agent is liberated by the disintegration of the blood-platelets and by the extravascular tissues which in the presence of calcium salts converts prothrombin into active thrombin.

It has been pointed out by several investigators^{5, 6} that a pronounced increase in fibrinogen occurs in pregnancy. Greisheimer⁷ working in conjunction with others has recently pointed out a correlation existing between the fibrin content of the blood and sedimentation, namely: that as the fibrin content increases, the sedimentation rate becomes more rapid. The excessive production of fibrinogen is probably an expression on the part of the body to control hemorrhage during labor by increasing the elements necessary for hastening blood coagulation.

Investigations of the calcium content of the blood in the gravid state have recently been reported in the literature. DeWesselow,⁸ Krebs and Briggs,⁹ Bogert and Plass,¹⁰ and Kehrer,¹¹ found the content lessened in the latter half of pregnancy. Meigs, Blatherwick and Cary¹² could find no significant lowering of the calcium in the whole blood or in the serum of pregnant cows. Denis and King,¹³ taking 9 to 11 mg. per c.c. as a standard for normal serum calcium, discovered significant changes in pregnant women.

Hueper¹⁴ found experimentally in dogs that the increased calcium content of the blood produced by injections of parathyroid extract augments the coagulability of the blood and favors the formation of thrombi.

From the results of the studies of these investigators, it is obvious that any increased coagulability of the blood encountered in pregnancy cannot be attributed to a hypercalcemia, and that the calcium content of the nongravid state is usually sufficient for the proper coagulation of the blood during labor.

The existence of blood-platelets has been known since 1882 when Bizzozero¹⁵ isolated the platelets and described their morphology. Numerous hypotheses have been suggested for their histogenesis. On morphologic grounds, Wright¹⁶ claimed that platelets are detached particles of the cytoplasm of the giant cells of the bone marrow (megakaryocytes) which are thrown into the blood stream.

The blood-platelet determinations for the normal as reported by various authors are indicated in Table I. The marked variations noted are due in part to the use of different methods of examination and to the fact that the number of platelets is altered by various physiologic states and changes from day to day.^{17, 18}

REVIEW OF THE LITERATURE

Our knowledge concerning the number of blood-platelets in different pathologic conditions, as well as in pregnancy, is incomplete, owing largely to different methods of enumeration. Only a few meager studies have been made of the variations of these bodies in pregnancy and in the puerperium.

TABLE I. NORMAL PLATELET COUNTS

| AUTHOR | NUMBER OF PLATELETS PER C.MM. |
|------------------------------------|----------------------------------|
| Thomsen ²⁷ | 250,000-300,000 |
| Wright and Kinnicutt ¹⁶ | 226,000-367,000 |
| Hayem* | 250,000 |
| Zeller* | 500,000-750,000 |
| Emden* | 200,000-300,000 |

*Quoted from Gram.⁶

Bizzozero¹⁵ was the first to contend that the platelets increased in pregnancy.

Rebaudi¹⁹ claimed that the number of platelets at any period of gestation is always greater than normal (300,000 per c.mm.), though it is subject to very noticeable fluctuations. He noted an increase during the first, second, and third months with a maximum of 630,000 per c.mm. in the first half of the fourth month. The total number declined slowly and gradually during the fifth and first half of the sixth month, reaching the maximum average of 950,000 per c.mm. at term, and a maximum average of 1,500,000 per c.mm. in the last stage of labor. Rebaudi observed a rapid diminution in the number of platelets within twenty-four hours after delivery, these falling to a minimum average of 560,000 per c.mm. He found an increase on the third day which continues during the fourth and fifth days until a maximum average of 930,000 per c.mm. is reached. After this peak is obtained, the number decreases in the following week until by the twelfth day of the puerperium it falls to an average of 670,000 per c.mm.

Dawborn, Earlam, and Evans²⁰ studied the blood-platelets in 28 unselected cases of parturition and 5 cases of cesarean section. They observed that these bodies

began to multiply in number on the fourth day postpartum, reaching a maximum representing a 100 per cent increase on the tenth to twelfth day. The platelets then gradually diminished in number, the counts made after three weeks being approximately normal. In two cases of severe hemorrhage the curves slightly exceeded the average. In 6 patients the rise was insignificant, whereas in 14 others the count was doubled or more than doubled. In 5 cases of cesarean section, the average rise was approximately 200 per cent, while the lowest was 146 per cent. The count reached a maximum in from nine to thirteen days and fell rather more slowly than in the normal parturition series.

Louros²¹ examined the blood of 66 women and found that platelets in the same individual varied from time to time. In 15 young nonpregnant women, he found an average of 350,000 platelets, ranging from 250,000 to 500,000 per c.mm. In 10 cases of pregnancy in the second month, he noted counts ranging from 370,000 to 600,000. In one case of parturition with fever, 420,000 platelets were present. In 14 gravid women in the eighth month, the count ranged from 500,000 to 650,000.

TECHNIC OF PLATELET COUNTING

The direct method of counting blood-platelets was employed in this study. By this method the blood is mixed according to the ordinary hemocytometric principle, using a diluting fluid which fixes and stains the platelets.

The diluting fluid of Rees and Ecker was found altogether satisfactory for our purpose as it affords one the opportunity of counting the red cells at the same time.²² The technic is essentially simple.

The diluting fluid is drawn to near the 1 mark in the ordinary pipette used for counting red blood corpuscles. Blood from a freely bleeding puncture is then drawn exactly to the 0.5 mark, and finally the diluting fluid is again drawn to the 101 mark. This gives a blood dilution of 1 in 200. In order that clumping of the platelets may be avoided, special care must be taken to draw the blood into the pipette immediately after puncture. The Levy-Hausser counting chamber is filled and ten minutes allowed for the platelets to settle to the bottom of the chamber before counting.

The platelets appear as sharply outlined, round, or oval glistening bodies.

The diluting fluid consists of:

| | |
|--|------------|
| Sodium citrate—3.8 per cent aqueous solution | 100.0 c.c. |
| Formaldehyde—40 per cent | 0.2 c.c. |
| Brilliant cresyl blue | 0.1 gm. |

With a dilution of 1 to 200, the platelets are counted in 400 small squares, and the number multiplied by 2,000. Thus, if 120 platelets are enumerated in 400 squares, the count would be 240,000 for each cubic millimeter.

The platelet determinations in this study were made under the direct supervision of Dr. Baxter L. Crawford, Pathologist of the Jefferson Medical College Hospital.

TABLE II. BLOOD-PLATELET DETERMINATIONS IN 50 NONPREGNANT WOMEN

| THOUSANDS PER C.MM. | NUMBER OF PATIENTS | PERCENTAGE |
|---------------------|--------------------|------------|
| 150-200 | 3 | 6 |
| 201-250 | 13 | 26 |
| 251-300 | 15 | 30 |
| 301-350 | 12 | 24 |
| 351-400 | 4 | 8 |
| 401-450 | 3 | 6 |
| Total | 50 | 100 |

Table II indicates the results of blood-platelet determinations in 50 nonpregnant women made according to the method herewith described. Dr. Crawford believes that a variation of 50,000 in the count is of no significance and may be due either to unavoidable error in enumeration, or to some alteration in the physiologic state of the patient examined. This adds to the difficulty of properly evaluating the rise or fall in the platelet count in any condition studied.

It is seen from Table II that 40 (80 per cent) of the 50 nonpregnant women examined had counts varying from 200,000 to 350,000 per c.mm.

PLATELET DETERMINATIONS IN PREGNANCY

The platelets have been studied in 230 gravid women and in 100 of these further studies were made during the puerperium. The counts were made on all patients registering in the Antenatal Clinic of the Jefferson Medical College Hospital. The results of the examinations in the 230 patients at different periods of gestation are described in Table III. Complete data disclose that 177 (77 per cent) had from

TABLE III. BLOOD-PLATELET DETERMINATIONS IN PREGNANCY

| THOUSANDS OF PLATELETS PER C.MM. | NUMBER OF PATIENTS | PERCENTAGE |
|-------------------------------------|--------------------|------------|
| 150 to 200 | 11 | 4.8 |
| 201 to 250 | 50 | 21.7 |
| 251 to 300 | 64 | 27.8 |
| 301 to 350 | 63 | 27.4 |
| 351 to 400 | 20 | 8.7 |
| 401 to 450 | 12 | 5.2 |
| 451 to 500 | 6 | 2.6 |
| Over 500 | 4 | 1.8 |
| Total | 230 | 100.0 |

200,000 to 350,000 platelets per c.mm., whereas 42 (18.2 per cent), had over 350,000 platelets per c.mm. No noteworthy relation between the platelet count and the length of gestation was found. A comparison of the platelet count in the nonpregnant and pregnant individual (Tables II and III) reveals that the number of platelets is not appreciably altered in pregnancy.

The average level of platelets is apparently not influenced by the diminished number of erythrocytes, nor by the rapid sedimentation rate ordinarily occurring in pregnancy.

PLATELET DETERMINATIONS IN THE PUERPERIUM

Platelet determinations of 100 unselected patients were performed within twenty-four hours after labor, on the third to fourth day, and on the eighth to the tenth day of the puerperium. The results of these examinations are depicted in Tables IV, V, and VI and in Fig. 1.

In this study only variations of more than 50,000 platelets were considered of importance. A count which did not vary by 50,000 in either direction during the puerperium was considered as "unchanged."

Table IV lists the counts of 100 women made within twenty-four hours after delivery. In this table it is noted that 27 per cent of the patients gained over 50,000 platelets per c.mm. Included in this group are 9 women with an increase of over 100,000 per c.mm.

Table V indicates the counts made three to five days after delivery. This table reveals that 55 women gained more than 50,000 platelets within five days after labor. Of this number, 20 gained between 50,000 and 100,000 whereas 35 gained over 100,000.

TABLE IV. PLATELET COUNTS WITHIN TWENTY-FOUR HOURS AFTER DELIVERY

| THOUSANDS PER C.M.M. | NUMBER OF PATIENTS | UN- CHANGED* | REDUCED OVER 50,000 | INCREASED 50-100,000 | INCREASED 100-200,000 | INCREASED OVER 200,000 |
|----------------------------|--------------------------|-----------------|---------------------------|-------------------------|--------------------------|------------------------------|
| 150-200 | 1 | 0 | 0 | 1 | 0 | 0 |
| 201-250 | 26 | 18 | 0 | 3 | 4 | 1 |
| 251-300 | 26 | 21 | 0 | 5 | 0 | 0 |
| 301-350 | 32 | 17 | 3 | 9 | 3 | 0 |
| 351-400 | 5 | 3 | 1 | 0 | 0 | 1 |
| 401-450 | 6 | 2 | 4 | 0 | 0 | 0 |
| 451-500 | 1 | 0 | 1 | 0 | 0 | 0 |
| Over 500 | 3 | 0 | 3 | 0 | 0 | 0 |
| Total | 100 | 61 | 12 | 18 | 7 | 2 |
| Percentage | | 73 | | 27 | | |

*Increase or Reduction Less than 50,000.

TABLE V. PLATELET COUNTS THREE TO FIVE DAYS AFTER DELIVERY

| THOUSANDS PER C.M.M. | NUMBER OF PATIENTS | UN- CHANGED | REDUCED OVER 50,000 | INCREASED 50-100,000 | INCREASED 100-200,000 | INCREASED OVER 200,000 |
|----------------------------|--------------------------|----------------|---------------------------|-------------------------|--------------------------|------------------------------|
| 150-200 | 1 | 0 | 0 | 0 | 1 | 0 |
| 201-250 | 26 | 2 | 0 | 7 | 11 | 6 |
| 251-300 | 26 | 12 | 0 | 8 | 5 | 1 |
| 301-350 | 32 | 15 | 5 | 4 | 7 | 1 |
| 351-400 | 5 | 2 | 0 | 0 | 2 | 1 |
| 401-450 | 6 | 3 | 2 | 1 | 0 | 0 |
| 451-500 | 1 | 1 | 0 | 0 | 0 | 0 |
| Over 500 | 3 | 0 | 3 | 0 | 0 | 0 |
| Total | 100 | 35 | 10 | 20 | 26 | 9 |
| Percentage | | 45 | | 55 | | |

TABLE VI. PLATELET COUNTS EIGHT TO TEN DAYS AFTER DELIVERY

| THOUSANDS PER C.M.M. | NUMBER OF PATIENTS | UN- CHANGED | REDUCED OVER 50,000 | INCREASED 50-100,000 | INCREASED 100-200,000 | INCREASED OVER 200,000 |
|----------------------------|--------------------------|----------------|---------------------------|-------------------------|--------------------------|------------------------------|
| 150-200 | 1 | 1 | 0 | 0 | 0 | 0 |
| 201-250 | 26 | 5 | 0 | 7 | 12 | 2 |
| 251-300 | 26 | 9 | 3 | 4 | 9 | 1 |
| 301-350 | 32 | 6 | 5 | 3 | 5 | 3 |
| 351-400 | 5 | 0 | 0 | 4 | 1 | 0 |
| 401-450 | 6 | 5 | 1 | 0 | 0 | 0 |
| 451-500 | 1 | 1 | 0 | 0 | 0 | 0 |
| Over 500 | 3 | 1 | 2 | 0 | 0 | 0 |
| Total | 100 | 38 | 11 | 18 | 27 | 6 |
| Percentage | | 49 | | 51 | | |

Table VI lists the counts of the same group of women within eight to ten days after delivery. It is observed that 51 per cent of the group had a gain over 50,000. Of these 51 women, 18 gained 50,000 to 100,000, 27 gained 100,000 to 200,000, while only 6 gained over 200,000 per c.mm.

It is particularly noted that no patient with a count of over 400,000 per c.mm. showed a gain in the puerperium.

A comparison of the alterations in the platelet count in the course of the puerperium is shown in Fig. 1. This reveals that 18 to 20 per cent of the patients had a rise of 50,000 to 100,000 during the various stages of the puerperium. Only 9 per cent, however, had the large increase

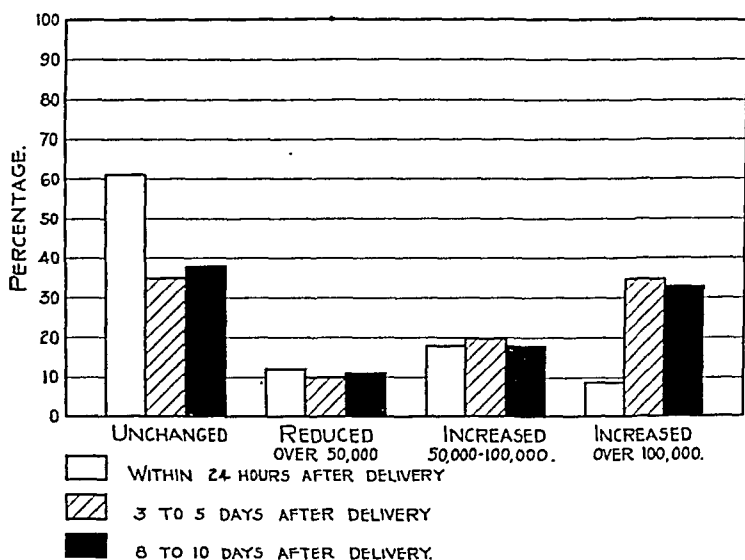


Fig. 1.—Variations in blood-platelet count of 100 patients in puerperium.

of over 100,000 within twenty-four hours, whereas 33 to 35 per cent showed this excessive increase within three to ten days after child-birth. The gain of over 100,000 represents in many cases a rise of 30 to 100 per cent above the original count in pregnancy.

DISCUSSION

From the results of our study it is apparent that no marked variation in the number of blood-platelets occurs in pregnancy. The significance of the failure of the blood-platelets to increase in pregnancy remains undetermined. It seems, however, that a rise in the platelets is not essential in increasing the blood coagulability in pregnancy. The added power of the blood to clot in pregnancy may be explained entirely on the basis of an increased fibrinogen content of the blood. A low platelet count encountered in pregnancy, however, may be an indication of the presence of a hemorrhagic diathesis, especially when the deficiency in platelets is associated with a severe grade of anemia. In such a contingency it may be of value to stimulate platelet forma-

tion by the use of the ultraviolet light or by irradiation with small doses of either radium or the roentgen ray as suggested recently by Cramer and Bannerman.^{23, 24}

Factors Concerned in the Platelet Rise in the Puerperium.—It is difficult to render an exact explanation of the rise of the platelet count in the third to the tenth day of the puerperium. According to Dawborn, Earlam and Evans, it appears that hemorrhage as ordinarily encountered is not the dominant factor, but that the destruction of tissue and its subsequent absorption may be the cause of the elevation.

It may be that the increased formation of platelets is in the nature of a defensive act of the body against infection, analogous to the physiologic leucocytosis in gestation. Evidence that the thrombocytosis is a defensive mechanism is found in the work of Téoumine.²⁵ This investigator believes a low platelet count in the puerperium is indicative of poor resistance on the part of the patient. The fluctuation in the number of platelets in puerperal infection probably reflects the relationship between the defensive forces of the organism and the aggressive forces of the infection. In cases of puerperal sepsis ending in recovery, Téoumine found the number of platelets was much higher than in those ending fatally. Nine of 11 fatal cases of puerperal septicemia had counts below 200,000 per c.mm., and toward the end the counts decreased still further. A gross increase in the number of platelets may probably be regarded as a favorable prognostic sign, while a continuous fall may signify a failure of the defensive forces of the body and possibly point to a fatal determination.

There were no puerperal infections or other serious complications in our series of 100 patients, so that we are unable to correlate the platelet fluctuations with any pathologic condition of the patient. It is our belief, however, that the platelet rise is a reaction of the body against invasion by pathogenic organisms.

It has been recently suggested that a relationship exists between the number of platelets and thrombosis. It was observed by Dawborn, Earlam and Evans²⁰ that the tendency to thrombosis increases when the platelets are augmented in number. These authors suggest that with a retarded flow of blood, thrombosis is more likely to occur in blood rich in, rather than poor in, platelets. In 2 cases, high platelet counts were found in association with thrombosis. The underlying cause of the slow regular swing of the thrombocytes appearing so regularly after operation and parturition could not be determined. They conclude that this late rise of platelets is a natural phenomenon—a physiologic response on the part of the bone marrow—comparable to the early leucocytosis which occurs in pregnancy.

Dawborn cites the following interesting case: A woman, para ii, aged thirty-three, was anemic before delivery. On the morning of the tenth day, postpartum, examination showed 1,270,000 platelets.

On the night of the tenth day she developed a thrombosis of the left internal saphenous vein, extending to the middle of the leg. On the following day examination showed 540,000 platelets. The count continued to fall for the next few days. On the twenty-second day, a rise was again noticed, and on the twenty-third day, the clot extended to the femoral vein in the groin. The platelet count continued to rise until the forty-sixth day, when the patient left the hospital much improved.

A similar case was reported by Evans²⁶ who observed a high platelet count in a patient with splenic anemia who died of mesenteric thrombosis.

No definite conclusion can be reached regarding the relation of thrombocytosis (increased number of platelets) to thrombosis or phlebitis. Further clinical and pathologic studies may enlighten us regarding this connection.

SUMMARY AND CONCLUSIONS

1. The blood-platelet count for the nonpregnant woman was found to vary from 200,000 to 350,000 per c.mm.

2. Platelet determinations were made in 230 women in various stages of gestation, and in 100 of these after delivery.

3. It was found that 177 (77 per cent) of the 230 gravid women had from 200,000 to 350,000 platelets per c.mm. of blood, while 42 (18.2 per cent) gave a count of over 350,000. Therefore, it may be stated that the blood platelets are not appreciably increased in pregnancy.

4. Twenty-seven per cent of the 100 women gained over 50,000 platelets per c.mm. within twenty-four hours after labor, whereas 63 per cent had either a gain of less than 50,000 platelets or had a lower count than in pregnancy.

5. Counts made three to five days after delivery reveal that 55 women (55 per cent) gained more than 50,000 platelets. Of this number, 35 gained over 100,000 platelets.

6. Fifty-one per cent of the counts made on the group of 100 women eight to ten days after delivery showed a gain of over 50,000. Twenty-seven of these 51 women gained 100,000 to 200,000, whereas 6 gained over 200,000 per c.mm.

7. The cause of the rapid rise in the number of the platelets in the puerperium is undetermined. It has been suggested that the multiplication of platelets may be physiologic, a natural response of the body to safeguard against possible infection. Further investigation is necessary to ascertain the reason for the postpartum increase in the platelets and to determine if any relation exists between the increase and the occasional occurrence of thrombophlebitis in the lying-in period.

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1621 SPRUCE STREET.

1703 SPRUCE STREET.

1717 PINE STREET.

Lee, Y. C.: The First Menses of Korean Girl Students. China M. J. 44: 1, 1930.

The average age of the first menses of 424 Korean girl students is fifteen years and this is very much earlier than that of girls in the northwestern part of Korea and Chinese women, but later than that of Japanese women.

Classified by occupation, the daughters of farmers, educators, and religionists develop later.

The first menses occur most often in the spring and summer. This agrees with Taguchi and others.

C. O. MALAND.

Weinberger, R.: Association of Grippe and Menstrual Disturbances. Med. Klin. 24: 1794, 1928.

During the course of an epidemic of grippe the author observed menstrual disturbances apparently due to the grippe. The patients usually had herpetiform vesicles on the upper lip, nose, and tip of the tongue, and about two-thirds of them had a skin affliction which resembled impetigo contagiosa. The temperature was seldom high. The patients, who before their illness menstruated normally, began to have hemorrhages, accompanied by pain as soon as the grippe started. The hemorrhages usually lasted four to six days. Physical examination both general and local showed no cause for this bleeding other than the grippe. The menstrual condition was regarded as being toxic in origin.

J. P. GREENHILL.

THE RESULTS OF AN INVESTIGATION AND THE TREATMENT OF STREPTOCOCCAL PUERPERAL SEPSIS AT THE TORONTO GENERAL HOSPITAL*

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THE high maternal mortality rate in this country is a subject of great concern, not only to the medical profession, but also to the laymen. A conservative conclusion obtained from the statistical reports of maternity clinics in different parts of the world shows puerperal sepsis to be the cause of 30 per cent of the deaths following childbirth. These reports also show that the organism found in the blood stream in from 70 to 90 per cent of the fatal cases is the *Streptococcus hemolyticus*.

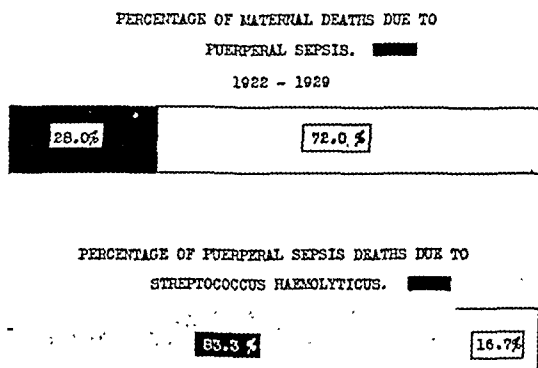


Fig. 1.

The investigation here reported was carried on over a period of two years (from the end of January, 1927 until the beginning of January, 1929) in the Burnside Department of the Toronto General Hospital, under the direction of Professor Hendry. We hoped to obtain information about the hemolytic streptococci which would be of practical value in either decreasing the incidence of that organism, or in treating cases already infected. It was thought necessary to find out the incidence of hemolytic streptococci in the cervical canal during:

1. The latter weeks of pregnancy.
2. The end of labor.
3. The puerperium in normal and all morbid cases.

Before this work was begun, a plan was outlined for the investigation of all cases of puerperal sepsis and for the classification and treat-

*Read at a meeting of the Academy of Medicine, Toronto, January 23, 1930.

ment of those cases due to the *Streptococcus hemolyticus*. Accurate results of this plan were kept and will be reported later in this paper.

Prenatal cultures from the cervical canal were obtained from our clinic patients about two weeks before the expected date of labor. During labor the cultures were taken either at the beginning or during the middle of the second stage. This procedure was carried out after the patient had been prepared. The vaginal orifice was spread open with the gloved fingers and a swab stick was inserted between the presenting part and the cervical or vaginal wall. The third group of birth canal cultures were taken from a certain number of patients with a normal puerperium, as well as from every patient showing a temperature of 100° F. for twenty-four hours. In the normal cases the cultures were taken on various days, from the second to the tenth. But in those cases showing a temperature, as indicated, the cultures were taken immediately. The postpartum cultures were taken under rigid aseptic precautions by exposure of the cervix with a speculum.

The culture material in each of these cases was obtained by rotating the swab stick in the cervical canal or around the presenting part. These sticks were then replaced in the sterile test tubes and taken to the bacteriologic laboratory. There the material to be examined was gently stroked across the surface of a sterile blood agar plate. These plates were then placed in the incubator and left for twenty-four hours. At the same time, a direct smear was also made and stained in the routine way by Gram's method, which often showed the presence of streptococci in chains, and thus enabled us to start the special treatment immediately. The blood agar plates were examined the following day after planting the cultures. The colonies of *Streptococcus hemolyticus* were distinguished by their size and shape and by the characteristic surrounding hemolytic zone. As we were particularly interested in the presence or absence of the *Streptococcus hemolyticus*, a record of the other organisms was not kept. It was necessary at times to transplant doubtful colonies into glucose broth which would be incubated for twenty-four or forty-eight hours and the fluid examined by direct smear.

To a clinician, the classifications of streptococci appears to be very complicated. We made no attempt to differentiate the types of hemolytic streptococci and followed a simple, general division suggested by Schottmüller. He divides streptococci into three groups, i.e.:

1. *Streptococcus hemolyticus*
2. *Streptococcus anhemolyticus*
3. *Streptococcus viridans*

The division is based on their cultural characteristics on blood agar. The hemolytic streptococcus is by far the largest group of the streptococci. This is found in many cases of infection and particularly in those found in the ear, nose, and throat. In puerperal sepsis we have an unlimited number of strains of *Streptococcus hemolyticus*. These varieties apparently all produce an exotoxin, and there is similarity in the reactions of these exotoxins as tested by the intracutaneous injections. Our series of 100 cases, three years ago, tested out with three varieties of puerperal sepsis exotoxin, showed that from 22 to 33 per cent of the patients were susceptible to this toxin, but only 2.85 per cent were susceptible to the scarlet fever toxin.

The appearance of genital erysipelas and scarlet fever in the puerperium may only be incidental, but some close association between the organisms producing puerperal sepsis, and those producing other infections, is within the realm of reason. This problem remains to be definitely proved. Possibly environment influences these organisms to a great extent.

The results of the cervical cultures were as follows:

1. *Antenatal Cultures*.—Five hundred eleven patients had cultures taken before labor during the various months of the two years. Only 7 of these cultures were positive for hemolytic streptococci.

2. *Labor Cultures*.—Cultures were taken from 432 patients during delivery and 14 were positive for hemolytic streptococcus. Out of these 14 cases, the *Streptococcus hemolyticus* disappeared during the puerperium in 7 but remained to produce definite evidence of infection in the other 7.

3. *Postpartum Cultures*.—In the third group, 435 patients were examined, 515 cultures taken and the *Streptococcus hemolyticus* was found in 52 cases. Of these 32 were cases of puerperal sepsis and the remaining 20 cases showed no evidence of infection.

The total number of cultures was 1458.

The total number of patients was 1378.

It was found in this investigation that the *Streptococcus hemolyticus*, although present, was not a common inhabitant of the cervical canal

TABLE I. CERVICAL CULTURES POSITIVE FOR STREPTOCOCCUS HEMOLYTICUS, BURNSIDE DIVISION, TORONTO GENERAL HOSPITAL

| MONTH | ANTENATAL | NATAL | POSTNATAL | CASES OF PUERPERAL SEPSIS |
|-------------|-----------|-------|-----------|---------------------------------|
| <i>1927</i> | | | | |
| February | 1 | 0 | 5 | 1 |
| March | 1 | 1 | 2 | 2 |
| April | 0 | 1 | 6 | 5 |
| May | 0 | 0 | 8 | 4 |
| June | 1 | 0 | 3 | 3 |
| July | 0 | 0 | 1 | 0 |
| August | 0 | 0 | 1 | 1 |
| September | 1 | 0 | 0 | 1 |
| October | 0 | 0 | 0 | 0 |
| November | 0 | 0 | 0 | 0 |
| December | 0 | 0 | 1 | 0 |
| <i>1928</i> | | | | |
| January | 0 | 1 | 1 | 1 |
| February | 0 | 5 | 7 | 4 |
| March | 0 | 0 | 3 | 3 |
| April | 2 | 2 | 6 | 2 |
| May | 1 | 1 | 2 | 1 |
| June | 0 | 0 | 0 | 0 |
| July | 0 | 0 | 1 | 1 |
| August | 0 | 3 | 2 | 2 |
| September | 0 | 0 | 2 | 1 |
| October | 0 | 0 | 0 | 0 |
| November | 0 | 0 | 1 | 0 |
| December | 0 | 0 | 0 | 0 |
| Total | 7 | 14 | 52 | 32 |

during pregnancy. This group of organisms was found in 3.24 per cent and 10 per cent of the cases in which cervical cultures were taken during labor and the puerperium. These organisms were much more

TABLE II. CERVICAL CULTURES POSITIVE FOR STREPTOCOCCUS HEMOLYTICUS, 1927-1928. BURNSIDE, TORONTO GENERAL HOSPITAL

| ANTENATAL | | | NATAL | | | POSTNATAL | | | TOTAL |
|-----------|------|----------|--------|------|----------|-----------|------|----------|--------|
| SMEARS | + VE | PER CENT | SMEARS | + VE | PER CENT | SMEARS | + VE | PER CENT | SMEARS |
| 497 | 7 | 1.4 | 432 | 14 | 3.2 | 529 | 52 | 9.8 | 1458 |

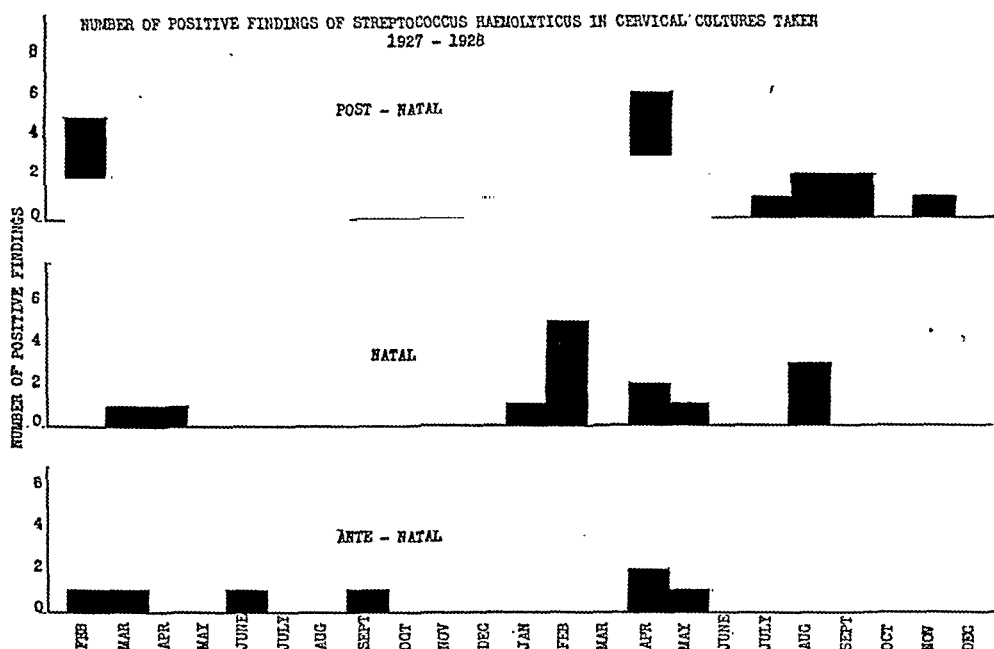


FIG. 2.

frequently found during the months of February, March, April, and May, both in the cultures taken at labor and also in those taken during the puerperium.

(a) 52 positive smears during the puerperium over a period of two years.

(75 per cent) 39 positive smears during months of February, March, April, and May.

(b) 14 positive smears during labor over a period of two years.

(71 per cent) 10 positive smears during February, March, April, and May.

During these two years, our records show infections of all types to be the cause of 32 per cent of the total morbidity (100° F. for twenty-four hours after the first day). Also, that over half of all the infections were cases of puerperal sepsis due to *Streptococcus hemolyticus*. The morbidity rate was found to be higher in the winter and early spring

months and this finding coincided with, and was dependent upon the increased evidence of the *Streptococcus hemolyticus* in the cervical canal during these months.

The study of the relationship that exists between *Streptococcus hemolyticus* and puerperal sepsis should include not only a summary of the incidence of this organism in the genital tract during pregnancy and the puerperium, but also a survey of the clinical manifestations and the results of treatment in this type of infection. We therefore kept over the same period (1927 and 1928) a record of the treatment carried out for all those patients showing a positive cervical swab for *Streptococcus hemolyticus*.

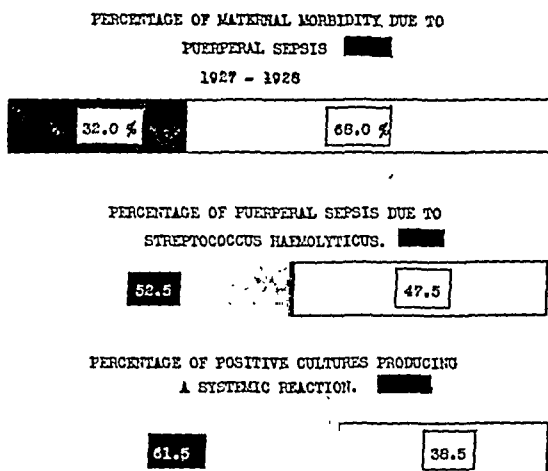


Fig. 3.

In order to find the cause of morbidity in the puerperium, it was necessary to investigate every case showing a temperature of 100° F. for twenty-four hours, as carefully as possible. This investigation included:

1. A careful examination of all systems, i.e., respiratory, gastrointestinal, cardiovascular, genitourinary, etc., and the breasts.
2. Blood examination: (a) R.B.C.
(b) W.B.C.
(c) Hemoglobin estimation.
(d) Blood culture if necessary.
3. Cervical culture.
4. Urine examination: (a) Routine.
(b) Microscopic.
(c) Culture.

Those cases of puerperal sepsis showing a positive cervical swab for hemolytic streptococci were divided into three groups with a subdivision into two for the third group. This division was based upon the patient's general and systemic reaction as evidenced by the height of the temperature. It was noted in the severe cases of infection that

the pulse curve was comparatively much higher than is usual in other types of infection. Another consistent finding in serious cases was the scantiness of the uterine discharge which maintained a characteristic chocolate colored serous appearance.

As mentioned previously, there were 32 cases of puerperal sepsis due to *Streptococcus hemolyticus* and 20 cases where the streptococcus found, produced no reaction. The grouping of these cases was as follows:

Group I: Serious cases, a positive cervical smear for streptococcus hemolyticus and a temperature over 102° F. for twenty-four hours.

Group II: A positive cervical smear and a temperature of 101° to 102° F. for twenty-four hours.

Group III: (a) A positive cervical smear and a temperature of 100° to 101° F. for twenty-four hours. (b) Positive cervical smear and no elevation of temperature.

Treatment.—The prophylactic measures of treatment were included in the antenatal care and the careful technic of the delivery room. The other measures carried out were based upon the division of the cases into the three groups already mentioned and were as follows:

Group I:

(Over 102° F. for twenty-four hours.)

- a. General Measures:
 1. Isolation.
 2. Fowler's position.
 3. Heat to abdomen.
 4. Ergot and quinine.
 5. Fluids pushed by mouth, or intravenously.
 6. Special care of perineum.
 7. Sunshine when possible.
 8. Substantial meals.
- b. Nonspecific Measures:
 1. Indirect transfusions, small, and repeated if hemoglobin 65 per cent or under and R.B.C. 3,000,000 or less.
 2. A few cases were treated with an intrauterine injection of carbolic in glycerin (1-16).
- c. Special Measures: Intravenous and intramuscular into each buttock, injections of scarlet fever antitoxin (30 to 45 c.c.). This was repeated once within thirty-six hours and in three cases twice within thirty-six hours.

Group II:

(101° to 102° F. for twenty-four hours.)

- a. General Measures, as outlined.
- b. Nonspecific Measures: when necessary.
- c. Special Measures: 30 to 45 c.c. of scarlet fever serum intramuscular into each buttock.

Group III:

- a. 100° to 101° F. for twenty-four hours: These cases were isolated, watched carefully and given ergot and quinine, and plenty of fluids.

b. No elevation of temperature:

These cases were placed in the same end of the ward and watched.

If the temperature of any of the cases in Groups II and III should rise, they would be treated according to the measures of the groups into which they would fall.

TABLE III. PUERPERAL SEPSIS DUE TO STREPTOCOCCUS HEMOLYTICUS, 1927-28. RECORD OF CASES. BURNSIDE, TORONTO GENERAL HOSPITAL

| GROUPS | TREATMENT | RESULTS |
|---|--|---|
| Group I 102° F. or over for twenty-four hr. | 1. General measures 2. Nonspecific when necessary 3. Scarlet fever serum (intravenous and intramuscular) | Positive cultures 4 Deaths 1 Total 17 cases |
| Group II 101-102° F. for twenty-four hr. | 1. General measures 2. Nonspecific when necessary 3. Scarlet fever serum intramuscularly | Total 6 cases |
| Group III (a) 100-101° F. for 24 hr. (b) No temperature | (a) General measures (b) Watched | (a) 9 (b) 20 Total 29 |

Results.—Seventeen patients during this period of two years (1927-28) were considered to be seriously ill and included under Group I. Six of these cases were transfused one or more times and the 17 cases received scarlet fever serum intravenously and intramuscularly. Of the 17 patients, 4 were found to have positive blood cultures showing *Streptococcus hemolyticus*. There were 3 recoveries from these and one death. This is the only fatality in the public obstetric wards caused by *Streptococcus hemolyticus*, from the Spring of 1926 up to the present date. In this fatal case, we found the *Streptococcus anhemolyticus* in the genital tract, but not the *Streptococcus hemolyticus*. Later on the latter was found in the urine and blood culture. We gave scarlet fever serum intramuscularly, because with the report of the *Streptococcus anhemolyticus*, it was not a typical case of puerperal sepsis. It is quite possible that this infection did not arise in the genital tract, but I feel now that an intravenous injection of scarlet fever serum might have helped.

In Group II there were 6 cases, all of whom received scarlet fever serum intramuscularly. In the third group, there were 9 cases showing a temperature from 100° to 101° F. and 20 cases with positive cervical swabs and no temperature.

SUMMARY

Septic Abortions.—The cases which recovered were treated within three days of onset of infection.

Puerperal Sepsis.—All *Streptococcus hemolyticus* patients died. They were not treated until one to three weeks after the infection.

TABLE IV. RESULTS GYNECOLOGIC WARDS (JUNE) 1926-27-28, SEPTICEMIAS FOLLOWING

A. Septic Abortions

| ORGANISM | | TREATMENT | RESULTS | |
|-------------------------------|----|------------------------|-----------------------|----|
| a. Streptococcus hemo-lyticus | 8 | (a) and (c) cases | <i>Deaths:</i> | |
| | | 1. General measures | Streptococcus hemo- | |
| b. Staphylococcus aureus | 1 | 2. Nonspecific | ticus | 3 |
| c. Unproved | 2 | 3. Scarlet fever anti- | Staphylococcus aureus | 1 |
| | | toxin intravenously | Unproved | 2 |
| | | and intramuscularly | <i>Recoveries:</i> | |
| | | | Streptococcus hemo- | |
| | | | lyticus | 5 |
| Total | 11 | | Total | 11 |

B. Puerperal Sepsis

| ORGANISM | | TREATMENT | RESULTS | |
|-------------------------------|---|---------------------------------|----------------------------|---|
| a. Streptococcus hemo-lyticus | 4 | a. Cases | Deaths: | |
| b. B. coli | 1 | 1. General measures | Streptococcus hemo-lyticus | 4 |
| | | 2. Nonspecific measures | Recoveries: | |
| | | 3. Specific measures | B. coli | 1 |
| | | b. Mercurochrome intrave-nously | Total | 5 |
| Total | 5 | | | |

The essential point of the whole question of treatment in puerperal sepsis is that the measures used should be begun as early as possible. In order to do this, we must have a systematic plan of investigation in every case of temperature in the puerperium. This plan of investigation should include a culture of the cervical discharge and this procedure should never be neglected. Besides the general and nonspecific measures of treatment which are fairly well known, we have used since 1926, scarlet fever antitoxin as the special measure in the treatment of puerperal sepsis due to *Streptococcus hemolyticus*. This serum was chosen because its immunizing power against one of the family of hemolytic streptococci could be measured. A specific type of hemolytic streptococci has never been proved to be the cause of puerperal sepsis. If this is true, it would be impossible to produce a specific serum against puerperal sepsis. The value of the scarlet fever serum may be due to:

1. A nonspecific unmeasurable power which is shown by a beneficial clinic result.

2. A production of immune antitoxic bodies.

3. A stimulation of the various defensive powers of the blood stream, such as the opsonic and phagocytic power of the white corpuscles and the bactericidal power of the serum.

It would appear that the stimulation of this defensive mechanism is the most natural method of combating in a special way an infection of this nature. The results obtained in these cases reported are very encouraging and they would seem to clearly justify its further use. However, one must distinctly remember that the outlook depends upon early diagnosis and early treatment.

CONCLUSIONS

1. Thirty-two per cent of morbidity in the cases reported were due to puerperal sepsis and in over 50 per cent of these, the *Streptococcus hemolyticus* was the causative organism.

2. The *Streptococcus hemolyticus* was found to be:

a. Seasonal in appearance.

b. Occasionally present in the genital tract during pregnancy, more often during labor, and most often in the puerperium.

3. The *Streptococcus hemolyticus* when found in the cervical canal during the puerperium is always a source of danger.

4. Early investigation and immediate treatment of puerperal sepsis cases is essential.

5. Scarlet fever antitoxin has a special value in the treatment of puerperal and postabortal cases of sepsis due to the *Streptococcus hemolyticus*.

6. Finally, further investigation on this subject is necessary. The possible value of antenatal immunization for all patients would seem to offer a fruitful research problem.

I wish to thank Dr. Donald Fraser of the School of Hygiene for his kindly interest, together with his invaluable help in this work. I am also grateful to Dr. Gordon Cameron for his careful bacteriologic examinations and reports.

Green, Armytage, V. B.: A Case of Torsion of a Fallopian Tube and Ovary During Pregnancy. *J. Obst. & Gynec. Brit. Emp.* 36: 87, 1929.

A sixteen-year-old girl, five months pregnant, presenting severe abdominal symptoms was laparotomized. The findings were: serous fluid in the abdominal cavity, adherent omentum, right tube and ovary twisted $2\frac{1}{2}$ times in the longitudinal axis close to the fundus, with partial gangrene. The tube and ovary were removed. The latter contained a corpus luteum. The patient delivered normally several months later. Complicating the convalescence following operation were kala azar, and the presence of various intestinal parasites.

FRANK SPIELMAN.

HYPERTHYROIDISM ASSOCIATED WITH PREGNANCY*

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(Assistant Professor of Surgery, New York Post-Graduate Medical School and Hospital. Assistant Attending Surgeon Bellevue Hospital. Assistant Attending Surgeon, St. Mark's Hospital)

IT IS a well-known fact that pregnancy is frequently accompanied by a hypertrophy of the thyroid gland. According to the more conservative the number of women thus affected is 40 per cent, while others place it as high as 90 per cent. These percentages vary according to whether they are taken from a goiter belt or from a seacoast community. Some refer to this condition as a physiologic enlargement of the thyroid but whether it be physiologic or pathologic is not settled, though the evidence at present would indicate it to represent a diseased thyroid state. We are referring to a primary enlargement during pregnancy and not a preexisting goiter which is aggravated by pregnancy. That excessive demands are made upon the thyroid at this time is borne out by multiparae showing evidence of thyroid enlargement during the fifth month, while primiparae do not show evidence of it until the sixth month. There are three types or stages of goiter, which include colloid, adenomatous, and exophthalmic goiter or Graves's disease. Whether these conditions represent separate diseases or stages of the continuous process is still unsettled, but Hertzler³ has led us to believe that the different types of goiter merely represent stages in a continuous process. His work is also borne out by Rienhoff⁵ and Hellwig.² In studying histologic sections of the thyroid in stillborn infants and in persons to eighty-nine years of age who met with accidental death, we have been forced to conclude that a correct diagnosis of thyroid diseases cannot be made from either the clinical picture or the histologic sections alone, but these must be studied together before arriving at a final diagnosis.

There are two types or stages of hyperthyroidism: (1) Adenomatous or nodular goiter. (2) Exophthalmic goiter or Graves's disease. It is essential to understand the fundamental differences in these two types or stages of hypersecretion. Some clinics go so far as to make definite clinical entities out of the above conditions, stating that they are separate diseases and not interchangeable, and that the management for one condition is different from the other, but at the present time this distinction does not seem warranted. Plummer⁴ has maintained that the hyperthyroidism of exophthalmic goiter was of a different type than the hyperthyroidism of adenomatous goiter and that iodine or Lugol's solution would be beneficial in the former but contraindicated

*From the Goiter Clinic of St. Mark's Hospital.

in the latter as a preoperative medication. Graham¹ proved that iodine was beneficial in both types preoperatively, but the quantity necessary to improve the adenomatous goiter was less than that for an exophthalmic goiter. It is very difficult to make a clinical classification which coincides with the histologic sections and one is not infrequently surprised when he has made a clinical diagnosis of adenomatous goiter with hyperthyroidism to receive a pathologic diagnosis of Graves's disease. The same holds true in typical cases of exophthalmic goiter that have received iodine therapy.

The following cases will illustrate the difficulties encountered if one relies on the history and physical findings on the one hand, or the histologic sections on the other.

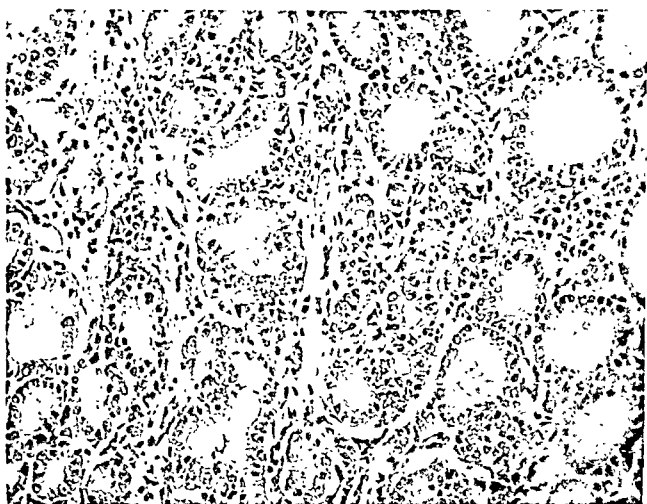


Fig. 1.—Diffuse epithelial hyperplasia with high columnar epithelium, narrow lumen with infolding and with little colloid. Active stage.

CASE 1.—Female, thirty-eight years of age, a nurse, was first seen by me on August 4, 1927; she stated that twelve years previously she had been operated upon for an adenoma of the isthmus of the thyroid. About one year after this operation she noticed a lump in the right side of her neck. This had increased slightly in size and about seven weeks before consulting me she had a gastrointestinal upset from eating sea food. Since that time she had lost 20 pounds in weight, and has had palpitation of her heart, and shortness of breath on going upstairs. Otherwise she felt well. Her menstrual periods had been scanty during the last few months. Examination: There was no evidence of exophthalmos in the right eye. The left eye had been enucleated following an accident at the age of two years. At the time of examination there was a nodular mass involving the right lobe without a thrill and her pulse was 108. A diagnosis of adenoma of the thyroid with hyperthyroidism was made. Basal metabolism on August 4 was a plus 45. The patient was advised to enter the hospital for operation, which she did, and was operated upon on August 22, 1927. She made an uneventful recovery, being discharged from the hospital on August 30, 1927. Pathologic report: Hyperplastic goiter of Graves's type, in a stage of remission at the time. See Fig. 1. This case was considered a typical adenomatous goiter with hyperthyroidism and an exophthalmic goiter was not suspected until receiving the pathologic report.

CASE 2.—Female, twenty-six years of age, was first seen by me on November 30, 1927 complaining of a swelling in her neck which she had had for one year. Friends first noticed a lump in the right side of her neck but at that time she had no symptoms referable to her goiter. Occasionally a sensation of pressure and choking were noticed but otherwise she felt perfectly well. Examination was negative, with the exception of a definite mass involving the right lobe of the thyroid. The left lobe was negative. Weight $133\frac{3}{4}$ pounds, pulse 100. Diagnosis of adenoma of the thyroid was made and basal metabolism on December 2, 1927 was plus 3. Patient was informed she had the type of goiter that could not be treated by medication, but as I had treated her sister for a colloid goiter with a satisfactory result, she demanded medication before submitting to an operation; hence she was put on thyroid extract, 1 grain t. i. d. The patient was next seen on January 18, 1928 at which time her weight was $137\frac{1}{4}$ pounds and pulse 90. She had no complaints but her neck remained unchanged and she was given thyroid extract, $\frac{1}{2}$ grain t. i. d. On March 21, 1928 she returned stating she had nausea and vomiting and had been bothered with diarrhea for two weeks and was begin-

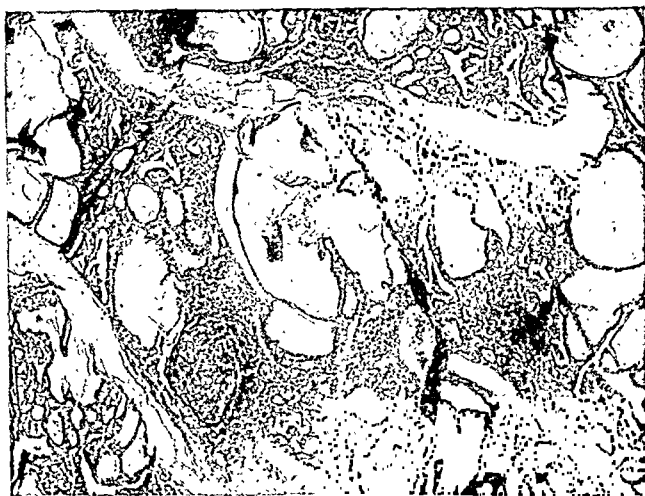


Fig. 2.—Diffuse epithelial hyperplasia. Some areas show narrow alveoli with little colloid and high epithelial lining, others contain much colloid. Numerous lymph follicles in stroma.

ning to feel ill. She complained of nervousness and palpitation and was losing weight. Examination revealed an enlargement over the thyroid region with a definite thrill over it, and a beginning exophthalmos. Diagnosis then made of exophthalmic goiter. Patient was advised to enter the hospital for observation and operation, which she did on March 22, 1928. Basal metabolism on March 26, 1928 was a plus 60. Weight was 105 pounds and pulse 160. The patient was operated upon on April 2, 1928 and made an uneventful recovery. Pathologic report: Exophthalmic goiter in the stage of remission Fig. 2. From the course of this case one can see a nodular type of goiter changed clinically to an exophthalmic goiter by thyroid medication.

CASE 3.—Female, thirty-three years of age, stated that in September, 1927 she consulted her family physician for a swelling of her left ankle and a goiter. At that time she was found to have a phlebitis of the left ankle. On communicating with Dr. Felder, her family physician, I found the patient had a colloid enlargement of her thyroid, without symptoms. The patient was not given any thyroid or iodine medication but five months later, as her mother had died from an

exophthalmic goiter, she consulted a thyroid specialist in New York, for she was rather conscious of the slight fullness in her neck. There were no symptoms referable to the thyroid at that time. Basal metabolism February 4, 1928 was a minus 1. She was informed that she had no thyroid disturbance but was given Lugol's solution 3 minims, t. i. d. Three months later she had lost 8 to 10 pounds in weight, her eyes were enlarged and she was nervous and quite irritable, and bothered with palpitation. She consulted another physician who told her she had



Fig. 3.—Diffuse epithelial hyperplasia with infolding. In some areas more marked than in others. Lymph follicles in stroma. Relatively low activity is shown best by increase of colloid secretion.



Fig. 4.—Very low magnification shows circumscribed adenoma.

Graves's disease. The patient was given 1 grain of iodide of mercury daily, and advised to have roentgen-ray therapy. She received several treatments and showed improvement but four months later, not feeling entirely well, she consulted Dr. Carter at which time her weight was 118 pounds, as against her best weight of 135 pounds. Basal metabolism on October 27, 1928 was 3 below the average normal. I saw this patient in consultation with Dr. Carter on October 28, 1928 at which time there was definite evidence of enlargement of the thyroid with a thrill over it, and it was quite apparent that the patient was suffering from an

exophthalmic goiter. Thyroidectomy was performed on November 5, 1928 by Dr. Carter. Pathologic diagnosis: Exophthalmic goiter in resting stage. (See Fig. 3.) One sees a colloid goiter which was changed into an exophthalmic goiter by iodine administration.

CASE 4.—Female, forty-five years of age, first seen June 2, 1927 complaining of nervousness, tremor of fingers, swelling of neck and protruding eyes, from which she had suffered for a period of five years. Her symptoms came on following the



Fig. 5.—Capsule of adenoma with adenoma on one side, and diffuse epithelial hyperplasia on the other.

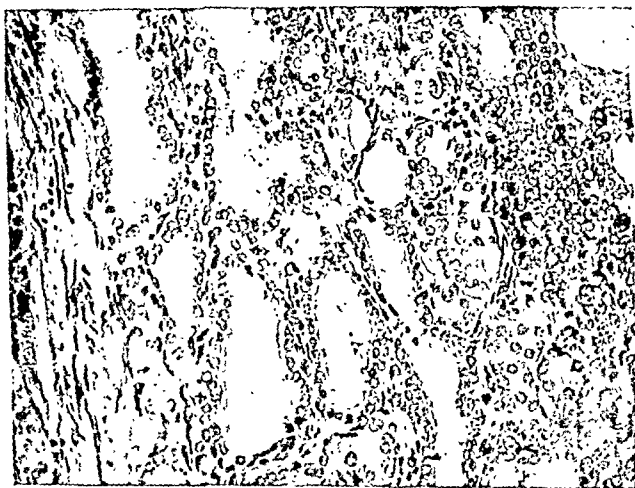


Fig. 6.—High-power magnification showing diffuse epithelial hyperplasia. Little colloid. Epithelial lining is high.

death of her daughter from pneumonia. The patient had had a cholecystectomy and appendectomy ten years previous to the time she consulted me; otherwise her history was negative. Examination revealed bilateral exophthalmos with symmetrical swelling of thyroid and thrill over it. The heart was fibrillating and the pulse could not be counted accurately. Basal metabolism on May 28, 1927 was a plus 69. Weight 157 pounds with pulse 150. The diagnosis of exophthalmic goiter was made and the patient was operated upon on June 11, 1927. Pathologic report:

Exophthalmic goiter in a resting stage, with two small adenomas. (See Figs. 4, 5, 6.) In this case the histologic sections revealed an adenomatous goiter and exophthalmic goiter in the same person which does not lead one to believe that they are separate clinical entities.

In view of the fact that the histologic findings in the above cases did not coincide with the clinical picture, we have taken sections from people whose deaths were due to accidental causes to determine whether the histologic findings are constant for different ages in life.

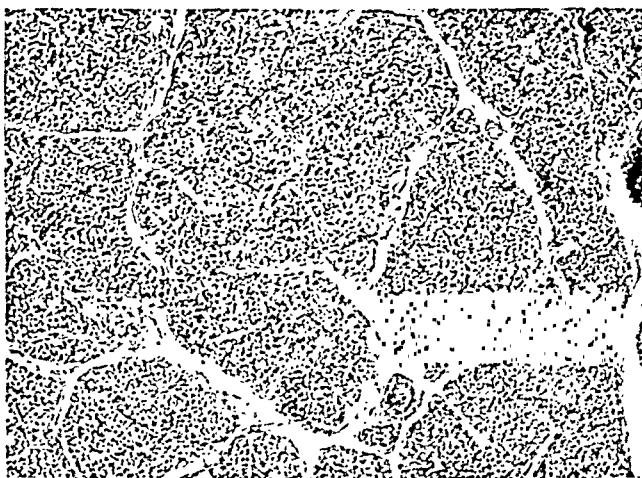


Fig. 7.

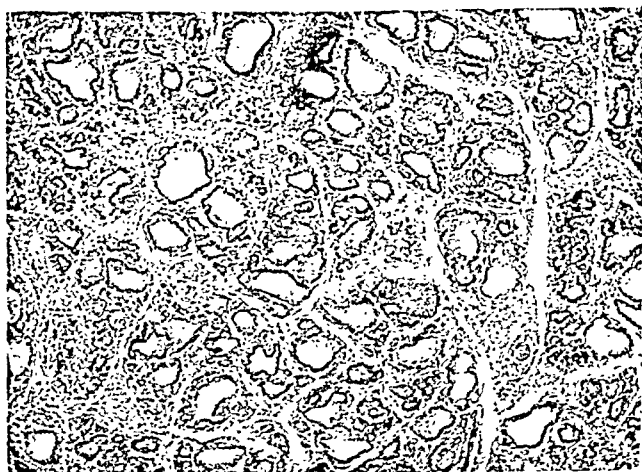


Fig. 8.

Fig. 7 is a section from a stillborn female baby, with cranial injuries. The section reveals epithelial cells divided into lobules by connective tissue and no definite formed acini. This represents what is usually found in fetal thyroids. Fig. 8, male, ten weeks of age, died from a rupture of the spleen. In this section one notes the acini well formed containing colloid with a marked amount of interacinal connective tissue. This section is so well developed that one might mistake it for an adult thyroid. Fig. 9, male, aged thirteen, cause of death

fractured skull. The section reveals very large acini containing colloid in parts of the section, while in other fields there are numerous epithelial cells closely spaced. Fig. 10, female, aged thirty-five, cause of death fractured skull. This section reveals one or two developing acini while most of the section contains dense masses of epithelial cells with connective tissue dividing the gland into lobules. The histologic picture in this section is more of a fetal type. Fig. 11, male, aged twenty-five, shot and instantly killed. This section reveals the acini large and dilated containing dense colloid material, showing a marked contrast with Fig. 10.



Fig. 9.

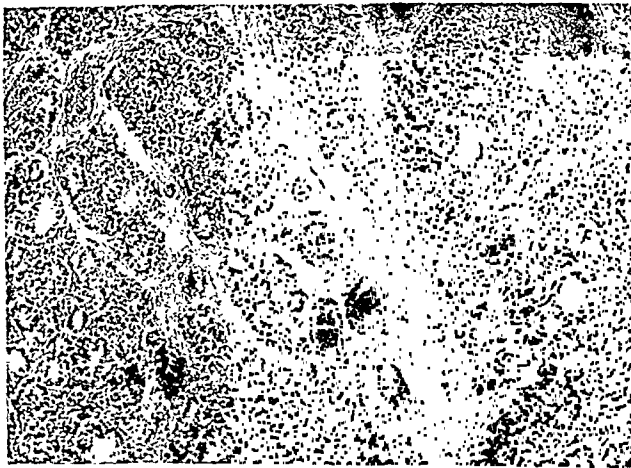


Fig. 10.

Fig. 12, female, aged sixty-one, committed suicide by strangulation. The section reveals epithelial cells closely spaced with some very small acini. The general appearance of this section is similar to that of an infant thyroid. Fig. 13, male, aged seventy-five, fractured skull and lacerated brain. This section reveals some well-developed acini containing colloid but in other parts the section reveals epithelial cells that are closely spaced with fibrous tissue forming a definite lobule. This section is more characteristic of an infant's thyroid than that of a man seventy-five years of age.

From the above sections it can be seen there is a marked variation in the histologic picture of the thyroid of people in apparently normal health who met with accidental death.

It is essential to look upon hyperthyroidism during pregnancy as one continuous process and not as separate diseases. From the above cases it can be seen how difficult it is to be certain of a diagnosis unless the

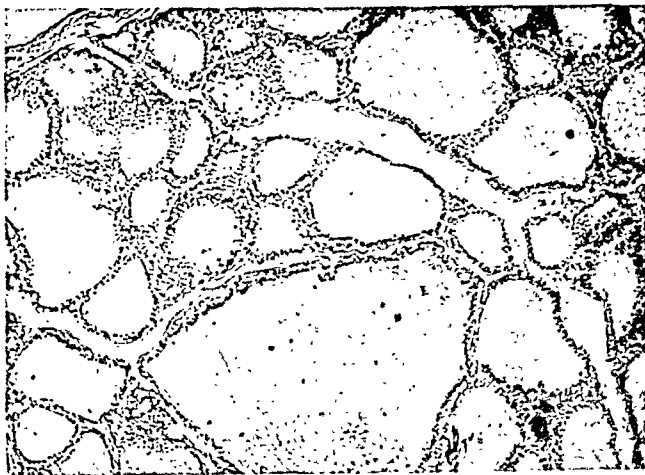


Fig. 11.



Fig. 12.

clinical findings and histologic sections are studied together, but for the clinical management of the patient it is essential to divide them into acute and chronic stages of hyperthyroidism, or exophthalmic goiter and adenomatous goiter.

Treatment.—Chronic hyperthyroidism, or hyperthyroidism from a nodular or adenomatous goiter usually occurs in women who have borne several children in rapid succession and who say an enlargement of

the thyroid was noticed after the birth of the first or second child, while the symptoms of hyperthyroidism may not develop until after the third or fourth pregnancy. What should be done in this type depends to a great extent upon the patient's condition and her desire to have more children. If the case is clinically mild with a metabolic rate not exceeding a plus 30, the patient can, in all probability, be carried through a normal pregnancy without any undue risk of permanent cardiac damage. But if the patient at the beginning of pregnancy has a high metabolic rate with a definite cardiac involvement, termination of pregnancy is advisable, and if the patient does not wish to submit to that the only alternative is a thyroidectomy after proper preoperative treatment.

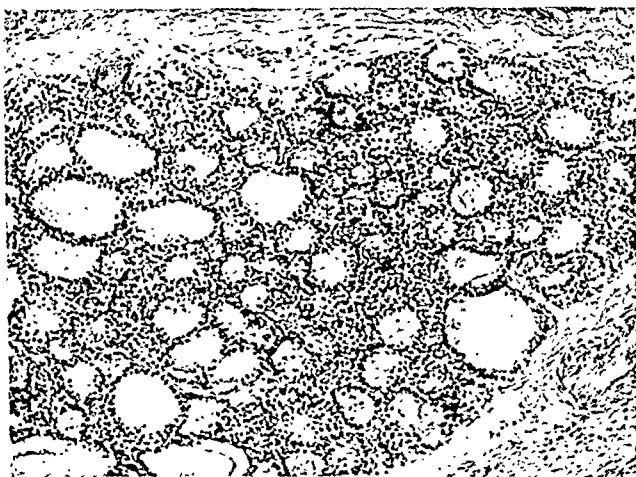


Fig. 13.

Exophthalmic goiter or Graves's disease usually develops in the early months of pregnancy, and more frequently in primiparae. The management will depend entirely upon the condition of the patient when first seen. Unless she is critically ill it is not necessary to interrupt the pregnancy but a thyroidectomy can be performed and the patient carried through a normal delivery. If the case is very mild it may be possible to carry the patient through her pregnancy on medical management and defer more radical measures until later.

Comment.—The two types of cases which need pregnancy interrupted are: First, chronic hyperthyroidism associated with the nodular or adenomatous goiter in which there is a definite myocardial degeneration; and second, cases of exophthalmic goiter or Graves's disease which are of a fulminating type and which endanger the life of the mother by allowing the pregnancy to continue. It is safe to estimate that 90 per cent of cases of hyperthyroidism associated with pregnancy can be carried to a normal delivery if properly managed.

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125 EAST SEVENTY-SECOND STREET.

PREGNANCY CONCOMITANT WITH ASTHMA OR HAY FEVER

By A. C. WILLIAMSON, M.A., F.A.C.S., PITTSBURGH, PA.

THERE is no patient more distressing or uncomfortable to herself and others than the asthmatic or hay fever victim. The asthmatic is distinctly a law unto herself, and in each instance a painstaking and meticulous history is necessary if relief is at all possible and if discovery of the cause is imminent. It would appear probable that pregnant patients would suffer more annoyance and that the dangers of miscarriage would be more possible than ordinarily. The questions arising are: Is miscarriage more frequent in asthmatics and hay fever patients than in others? Does the time of pregnancy, the trimester, have an effect, or is it influenced by the preexisting condition? Can the patient be treated during a pregnancy, i.e., the desensitizing of a known pollen type, without danger to the pregnancy? Is there any special influence on the infant or not? The following case presentations with their histories are interesting and curious and assuredly bear out the statement that the asthmatic or hay fever patient is distinctly a law unto herself.

GROUP I. ASTHMA

CASE 1.—Mrs. C., white, age twenty-eight years, para ii. Normal in every way except for asthma which began with onset of her periods at the age of thirteen years. For eleven years she has averaged two attacks monthly, but there seems to be no definite periodicity from a standpoint of etiology. The attacks are "terrific," lasting from four hours up to three days and followed by "collapse," necessitating one to three days in bed. She has tried all the usual remedies with little or no relief and now requires large doses of morphia during attacks. During her first pregnancy she had no attacks until just before delivery; the attack then was not severe. Her labor lasted seventeen hours. She was delivered under gas-oxygen; an easy low forceps delivery. She nursed her baby for seven months and had no attacks until weaning—when the old twice-a-month régime again was inaugurated. With the second pregnancy she had two mild attacks at the third and seventh months. Her labor was short, delivery spontaneous under gas-oxygen. During both pregnancies she was troubled with a skin irritation which could only be relieved by a liquid diet and the use of paraldehyde as a soporific.

CASE 2.—Mrs. R., white, age twenty-seven years, para i. She has had severe attacks since she was four years old, whenever she has been tired or "nervously upset." Her pregnancy was comparatively comfortable until the seventh month, from then on attacks at approximately twelve-day intervals. Her labor was of twenty-four hours' duration; just before full dilatation an asthmatic attack lasting for three hours occurred. Morphia and adrenalin did not help. At full dilatation,

gas-oxygen was attempted, a 40 to 60 mixture, but was useless until 25 per cent ether was added, then the patient began to breathe easily in about six minutes. Delivery was an easy low forceps, but patient went into moderate shock, pulse at the wrist not being picked up for two hours. Digitalis was started with the idea of supporting the heart. Fourteen hours after delivery another severe attack, with the pulse climbing to 168 and temperature 101°. Morphia and adrenalin were of no avail, a few breaths of ether gave immediate relief, the patient dropped off to sleep, woke three hours later, again the attack began and relief was impossible, the pulse climbed steadily, heart dilated, and seven hours later she died. Autopsy revealed emphysema in lungs, a particularly thinned-out, flabby heart muscle with definite myocardial changes. The baby was apparently normal.

CASE 3.—Mrs. H., white, age thirty-six years, para iv. The patient has been "asthmatic" since sixteen years of age, having about eight attacks yearly with no definite periodicity or etiology. She has had two boys and two girls. During gestation with the girls she was free from attacks and after delivery nursed the girls up until the sixth month, and during lactation there were no attacks. During the pregnancy involving the two boys, she was troubled with marked nausea and vomiting and had four and three terrific attacks of urticaria respectively. Both boys were sensitive to egg albumen, and one child at five years is an "asthmatic" apparently, and the other boy at seven apparently is suffering from rose fever, although skin tests show several food and plant idiosyncrasies as well. The labors were all easy and spontaneous.

CASE 4.—Mrs. H., white, age twenty-five years, para i. Asthmatic attacks began at the age of fifteen years, simultaneously with first period, and since then they have occurred at any time. She thinks they usually come when she is particularly tired or constipated. Skin test showed reactions to several foods, to a few pollens and to horse hair, but in her manner of life the exact etiology of these must be doubted. She has always been subject to "colds" and is never free from "catarrh." Her one pregnancy was a comfortable one, and she had no attacks during the period of gestation or lactation. Seven weeks after weaning her baby she again had an attack but not quite so severe and in the last two years the attacks have been as frequent but not so severe as formerly. Her baby has no idiosyncrasies of any sort as far as protein sensitization is concerned.

CASE 5.—Mrs. K., white, age thirty-two years, para ii. She has been an asthmatic since the onset of menstruation at sixteen. She averages four severe attacks and possibly six minor attacks during the year. During her first pregnancy, resulting in a boy, she was without attack and had none until she weaned the child at eight and a half months. During her second pregnancy, with a female, she was nauseated and decidedly uncomfortable from urticarial attacks and skin irritations. She had one severe seizure at the third month, and at postpartum had attacks apparently as before despite nursing the child. The infant had severe eczema and was markedly sensitive to cow's milk and egg albumen.

CASE 6.—Mrs. M., white, age thirty years, para iii. Her first attack occurred eleven years ago, a month after coming to America. Since then she has had to guard against fatigue and overeating. She says the attacks were less severe during her pregnancy, and yet five hours after her third delivery she developed an acute attack lasting sixteen hours, scarcely relieved by adrenalin or morphia. During lactation she was relatively free from attacks. Her baby had marked eczema from the third to twenty-first months but had no one special food idiosyncrasy.

CASE 7.—Mrs. K., white, age thirty-six years, para iii. She has been an asthmatic since she was sixteen years old and thinks the attacks began with the onset of menstruation. There has been no special periodicity of attacks, but there has always been an attack when she has been particularly tired. Her general health has been good except for a "catarrhal condition" and susceptibility to "colds."

She has been free from attacks during each gestation except that while she was pregnant with the second child—a boy—an annoying urticaria caused much annoyance. She was unable to nurse the two boys and her asthmatic attacks began almost immediately. She nursed the girl and had only one attack during lactation and that was at the fifth month.

CASE 8.—Mrs. H., white, age thirty-two years, para i. Has been an asthmatic as long as she can remember. She has been usually well, aside from frequent colds. During pregnancy she had no attacks, the labor was short and easy. During lactation she had no attacks, and it was the first time she had always been free from her difficulty.

CASE 9.—Mrs. K. C., white, age thirty-two years, para ii. Her asthma began at the age of fourteen years, a year after the onset of catamenia. The attacks always seemed to follow a period of being tired or quite "upset nervously." During both pregnancies the nausea was persistent and at intervals would terminate in an asthmatic attack lasting for twenty-four to thirty-six hours, unrelieved by the usual remedies. During lactation there was no change. Her baby had eczema up to the eighteenth month.

CASE 10.—Mrs. C., white, age forty-one years, para iv. She has been an asthmatic since a "small child." There is no time interval between attacks, but their frequency has increased in the last four years with practically no relief from the use of adrenalin or morphia. With the third pregnancy she was in bed from the eighth month onward, and with the fourth she was in bed from the sixth month because of a failing heart. She was unable to nurse her children. The first child had severe eczema until twenty-two months old and now at eleven years is a confirmed asthmatic.

CASE 11.—Mrs. D. A., white, aged twenty-six years, para iii. She came to this country from Italy and had her first attack at seventeen, her first autumn here; since then her attacks have occurred almost once a month, at her menstrual period without fail. Her pregnancy and lactation periods seem to have no bearing on the condition. This pregnancy and labor were uneventful, but on the fifth day postpartum a severe attack lasting ten hours occurred, relieved only by large doses of morphia. Her children are apparently well, with no complicating idiosyncracies as far as skin or food are concerned.

CASE 12.—Mrs. D. S., white, age twenty-five years, para i. The onset of attacks dates back nine years. The attacks are at any time during the year and practically have made an invalid of her for four years. Following an attack of tonsillitis, three years ago, a diagnosis of severe mitral stenosis was made. Cesarean section with sterilization under local anesthesia was refused. The labor lasted twenty-one hours and was terminated by an easy low forceps delivery with nitrous oxide-oxygen anesthesia. Her pulse rose to 168, temperature to 101.6°. For forty-eight hours she was on the verge of decompensation but quieted gradually through the generous use of morphia and digitalis. After twenty days' rest in bed, her pulse dropped to 96 and her convalescence was uneventful, she became restless and insisted on going home against advice. She was warned of the dangers but in spite of this attempted to get out of bed four days later, precipitated an asthmatic attack and died four hours after the onset.

CASE 13.—Mrs. D., white, age twenty-three years, para i. Her first attack of asthma was at the age of fifteen years; since then she has had about eight severe attacks a year. If "she does not get tired or catch cold," she has no attacks. During her pregnancy the hyperemesis was severe. At the seventh month she developed eclampsia and spontaneously delivered a stillborn infant. She recovered promptly. An asthmatic attack occurred on the ninth day but was immediately relieved by adrenalin.

GROUP II. POLLEN TYPE

CASE 1.—Mrs. H. E. S., white, age thirty-one years, para iv. She is troubled with the "goldenrod" variety. When a child, she had a mild reaction to eggs. For eleven years she has been increasingly annoyed with the condition. She had a miscarriage at two and one-half months. Her two successful pregnancies ended in November and February. She was given vaccine during her fourth pregnancy, the initial dose beginning two months previous to pregnancy. She obtained no relief, but the season during her pregnancies was relatively mild.

CASE 2.—Mrs. M., white, age twenty-six years, para i, has had "rose fever" for eleven years. She had two years of vaccine treatment starting during the second month of pregnancy with no ill effect. The relief by reason of vaccine has been remarkable. The attacks were so annoying that it was considered necessary to initiate treatment. During gestation urticaria was frequent and annoying, but she did not obtain relief by alkalization. The labor was uneventful as was the postpartum convalescence.

CASE 3.—Mrs. H., white, age thirty-seven years, para v. She has had hay fever since seven years of age, August and September being the particularly troublesome months. Goldenrod seems to be the offending agency. She received treatment during the second and third pregnancies—on one occasion during the first trimester and the second time during the second trimester with no ill resulting. The relief was so slight that she refused to bother with more immunization. With male pregnancies she suffered from severe urticaria, but no discomfort when pregnant with female. Both boys had marked eczemas—one is a severe asthmatic, the other has apparently nothing more than the childhood eczema. Fortunately all labors were short and uncomplicated.

CASE 4.—Mrs. R., white, age twenty-six years, para ii. This patient suffers also from goldenrod variety, the attacks began, she thinks, with the onset of catamenia at the age of fourteen years. During her first pregnancy immunization was attempted at the middle of the first trimester and she miscarried at third period. She went through a second pregnancy with little difficulty except for a severe urticaria which seemed to occur with some relation to the time of period. The baby had a moderately severe eczema until the twentieth month and showed a marked reaction to eggs.

CASE 5.—Mrs. G., white, age thirty-one years, para iii. She has been troubled for twelve years, the attacks beginning about the middle of May and continuing until July. She has been pregnant twice during this time and had no apparent difficulty. Of the children, the boy had eczema badly, the two girls had no trouble at all. She does not think that pregnancy influenced her attacks in any way.

CASE 6.—Mrs. B., white, age twenty-seven years, para i. The paroxysms of sneezing begin the middle of August and continue through September. They began apparently with the onset of catamenia, fourteen years before. She had the attacks during the sixth and seventh months of gestation with practically no variation in severity. Labor was short and easy, normal in every way. The baby also was apparently normal but died suddenly on the third day and the death was termed a thymic one.

CASE 7.—Mrs. O'C., white, age twenty-three years, para i. She has always been a healthy person aside from an annoying idiosyncrasy of nasal irritations and frequent cold. For five years she has been subject to what was termed rose fever, and despite the pregnancy the affair was so serious she determined to begin a course of treatment. The inoculations were carried out from the fourth to sixth month of pregnancy with no apparent ill effect. Labor was easy and the baby well; there

were no skin eruptions, but the patient was unable to take anything with egg used in any way.

CASE 8.—Mrs. L., white, age thirty-nine years, para ii. Fibroid uterus. She has hay fever attacks beginning in early July and continuing throughout to mid-September. She dates their beginning when about fifteen years old. Skin testing has shown a variety of causes, hence she refused inoculations as an attempted remedy. Her second pregnancy at the fourth month on carried through the period, and she thought that she was not as distressed as usual. Labor was uneventful, but the baby had an eczema lasting for twenty months and now at four years old is apparently developing into a typical asthmatic.

CASE 9.—Mrs. S., white, age twenty-six years, para i. The condition has been present for nine years, and she thinks it gets a little more severe each year. For three years she was treated, and although the cause seems to be definitely goldenrod, she has no relief. Her labor was normal, and everything was well until the fifth day, when she developed a frightful urticaria which would not respond to treatment. Bromides and opiates were all employed; ephedrine and adrenaline were of no avail, and after three sleepless days and nights the condition disappeared almost at once. The baby apparently is well and free from skin troubles.

CASE 10.—Mrs. K., white, age twenty-six years, para i. The etiology here is definitely in the rose fever class. Inoculations were carried out during the second and fourth months of pregnancy with no ill effects but with a definite lessening of the severity of the attack during the year. The pregnancy was uneventful, but the baby has a nasty eczema which will appear at regular intervals for no reason at all.

CASE 11.—Mrs. C., white, age twenty-seven years, para iii. This patient was born in the South and had no trouble until her first visit North seven years ago. During the entire residence in the North the trouble has begun late in May, lasting well up until the middle of July. The boy had eczema badly, and during this gestation she was free from attacks. Her girl had no difficulty, but she was miserable with rose fever. With the third pregnancy, also a boy, she had little trouble, and the child has been free from all attacks.

CASE 12.—Mrs. C. T., white, age twenty-two years, para ii. The first two pregnancies ended in miscarriages at the third month. An infantile uterus would offer some explanation. The fever is of the goldenrod type, and a pregnancy seemed not to affect it one way or the other. She had just as violent paroxysms of sneezing, and despite the fact that she was only in the middle third of her gestation it seemed to make no difference. The child, a girl, is seemingly free of skin difficulties.

CASE 13.—Mrs. T., white, age thirty-three years, para ii. The mother has never been a severe hay fever type. She thinks it began five years ago and that it is more severe each year. Her first child, now four years old, has been troubled with an unusually severe eczema which is persistent and unrelieved. When she was pregnant the second time, she insisted on skin testing, the cause apparently was goldenrod. The second child, also a boy, apparently has escaped the condition, and the mother is sure it was due to her being treated.

CASE 14.—Mrs. C., white, age twenty-seven years, para ii. An extremely sensitive person who dates her hay fever back nine years and attributes it to goldenrod. She has been repeatedly tested and treated with no apparent result. Her first boy had eczema mildly but had to be taken off cow's milk altogether. The second delivery occurred in July and was easy and uneventful. On the ninth day post-partum she suddenly developed an urticaria that was maddening. Nothing relieved it, and at the end of ninety-six hours it spontaneously disappeared. The second baby, a girl, has a slight eczema, but has no difficulty in handling a formula of cow's milk.

CONCLUSIONS

The study of these cases offers a variety of observations that are satisfying, and yet there is a variation of symptoms and of apparent cause and effect which is bewildering. The asthmatic group bears out almost to a patient the part played by heredity in transmitting the tendency to the disease. In no case was it known that the husband was affected, and yet practically every child showed an eczema or an idiosyncrasy toward food. It is quite generally assumed that of hypersensitive parents, both being involved, 72 per cent of children will show asthmatic signs before they are ten, and 58 per cent where only one parent is involved. We cannot substantiate this statement because the children involved are not of that age. It is a striking coincidence, however, that practically every child developed either an eczema or a food idiosyncrasy.

As far as severity of attacks go, apparently asthmatics, as such, seem to have less frequent attacks during the period of gestation and puerperium. It may be argued that it is because they get more rest and more care is taken in the prevention of constipation, together with an attempt to guard against abnormal excitement. The pollen type seems to vary not at all. A most striking observation is that the attacks with all their paroxysmal sneezings and coughings together with the unpleasant dyspnea do not seem to bring on premature labors or miscarriages. It would be fair to state that no patient had a violent attack near term, so that we could not definitely answer in regard to early rupture of membranes.

Skin testing has been rather disappointing. These patients were tried out with placenta dried, but there was no constant result which would warrant a special conclusion. It seemed to me that they were sensitive and reacted to so many reagents that it would be difficult to narrow down to an exact etiology. It is curious to note, however, that the same mother during gestation with a male child would be free from the discomfort of urticaria or "food poisonings" and yet be most sensitive if pregnant with a female child or vice versa. Equally strange is the fact, too, that one sex would have eczema and no food difficulty while the other sex would have both.

It would also seem that there is no reason why the mother should not be treated as though she were not pregnant. In the cases that have come under my observation the trimester of gestation seemed to have little to do with the treatment. The danger of miscarriage is always imminent in the first three months; if we treat a patient then and she miscarries, we are likely immediately to blame the hypodermic, when as a matter of fact there is no evidence of direct cause and effect. We would select our cases and treat them individually.

There seems to be no bearing on anesthetic, and nitrous oxide-oxygen has been completely efficacious with an occasional small percentage of ether for temporary relaxation.

FIBROMYOMA UTERI, TREATMENT AND END-RESULTS*

A REVIEW OF 254 CASES

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THIS paper represents an analytic study of 254 consecutive cases of myoma uteri admitted to the service of the senior author in the Hospital of the University of Pennsylvania from January, 1927, until July, 1929. The discussion will be limited largely to methods of treatment and end-results.

We share the commonly accepted belief that many myomas require no treatment. This applies particularly to small symptomless tumors in women who are approaching or who have passed beyond the menopause. It is our practice, however, to keep such patients under close observation, insisting upon the importance of periodic examination. Such a policy is attended by little or no risk, and many patients will be saved an unnecessary operation.

By far the greater number, however, require treatment on account of abnormally profuse bleeding, pain or pressure symptoms, and it is upon this group that our studies have been made. In this series, 62.7 per cent of the patients gave a history of menorrhagia, metrorrhagia was present in 9 per cent, lumbar or sacral backache in 27.1 per cent and pressure symptoms in 29.4 per cent.

Difference of opinion still exists regarding the treatment of these tumors. In some clinics operation is the method of choice in all cases, while others employ irradiation by either radium or roentgen rays to the exclusion of surgical measures. It is our belief that both of these plans are to be condemned; both irradiation and operation have their places in the treatment of myomas. The indications and contraindications of each are sharply defined, and the proper treatment as applied to any given case depends upon an intelligent conception of the advantages and limitations of each method.

It was the privilege of the senior author to be associated with the late Dr. John G. Clark when he first adopted radium in the treatment of benign uterine hemorrhage in 1912. During these eighteen years the patients have been carefully followed, and the rules which govern us in the selection of irradiation or operation are based upon this experience. It is gratifying to note that the indications thus formulated by Dr. Clark and his associates have been more or less generally adopted.

The following type of case we consider ideal for the use of radium;

*Read (by invitation) at a meeting of the New York Obstetrical Society, March 11, 1930.

a patient in the fifth decade of life who has a tumor not larger than a three months' pregnancy, the only symptom of which is profuse menstruation.

The contraindications to the use of radium are as follows:

1. *Tumors Larger Than a Three Months' Pregnancy.*—Such tumors often present extensive degenerative changes which are not favorably influenced by irradiation. In this series benign degenerative changes were found in 37.3 per cent, cystic degeneration was present in 21.2 per cent, calcareous in 12.2 per cent, and less frequently carneous, hyaline and liquefaction changes occurred. The larger tumors are frequently complicated by adnexal conditions, the detection of which is often impossible prior to operation. There were associated ovarian lesions in 44.4 per cent of our cases, and many of these were not suspected prior to laparotomy.

Furthermore, the blood supply of the larger tumors is very limited, and irradiation may so impair their nourishment that degenerative changes may readily occur.

Large tumors frequently distort the uterine cavity to such an extent that a thorough diagnostic curettage is precluded, and under these circumstances an area of corporeal carcinoma may easily escape detection.

While the etiologic relationship between submucous myomas and carcinoma of the fundus has never been definitely established, there is sufficient evidence to warrant removal of large tumors as a prophylactic measure. To substantiate this we cite Graves' statement that fibromyomas were associated with 25.7 per cent of his cases of carcinoma of the fundus.

2. *Rapid Increase in Size.*—Rapid enlargement of a tumor usually indicates either sarcomatous or benign degeneration, in both of which operation is demanded. Sarcoma was found in 2 of our cases, an incidence of 0.8 per cent.

3. *Pressure Symptoms.*—Frequency and urgency of urination, increasing constipation and other pressure symptoms are mechanical in origin, and their relief is dependent upon removal of the tumor. While disappearance of the tumor is a common occurrence following irradiation, the process is slow and excision is preferable.

4. *Tumors Associated With Pelvic Pain.*—Pain in association with a myoma is usually due to one of the following conditions: adnexal disease, especially chronic inflammation, degeneration of the tumor, adenomyoma, or endometrial cysts of the ovary. Radium may light up a quiescent inflammatory lesion and is to be avoided in any patient whose history suggests its presence. The frequency of this complication is evidenced by the fact that it was found in 23.3 per cent of our cases. For obvious reasons degenerating tumors should never be subjected to irradiation. Adenomyomas of the uterus often do not respond

satisfactorily to irradiation, and our experience is confirmed by Kelly who states that in the treatment of these tumors "radium is of no avail." Again, pain may be due to an associated endometrial cyst of the ovary, the treatment of which usually falls in the domain of surgery. While it may be impossible to determine prior to laparotomy the exact cause of the associated pain, the conditions revealed at operation will practically always justify the choice of surgical treatment.

5. *Pedunculated Tumors, Both Subperitoneal and Submucous Myomas.*—Radium is useless in the treatment of pedunculated tumors, and in the submucous type its action may be followed by rapid necrosis and infection.

6. *Profound Anemia.*—We hesitate to use radium in the treatment of a moderate sized tumor in the presence of severe anemia. Such patients often react poorly to it, and their diminished resistance increases the possibility of necrosis or infection of the tumor.

7. *Uncertain Diagnosis.*—The prime requisite for successful irradiation is accuracy of diagnosis. If examination under anesthesia does not reveal the exact nature of the pelvic pathology, operation is the preferable procedure.

8. *Stenosis or Blockage of the Cervical Canal.*—Irradiation of the uterine body demands that the radium be inserted well above the internal os, otherwise it may lead to partial or complete stenosis resulting in pyometra or hematometra.

9. *The Presence of Marked Secondary Anemia in Association With Tumors Not Giving Rise to Sufficient Uterine Bleeding to Account for the Anemia.*—Several such cases have come under our observation. In each, careful studies failed to demonstrate the cause of the anemia, and at operation extensive necrosis of the tumor was found. Rapid improvement of the anemia following operation warrants the conclusion that the degeneration was responsible for it.

10. *Tumors in Young Women.*—Irradiation in sufficient dosage to cause disappearance of the tumor will be followed by a premature menopause and sterility. Such patients should be treated by operation; myomectomy is the method of choice, but if this is not feasible, supravaginal hysterectomy, with conservation of one or both ovaries, is indicated.

11. *Extremely Nervous Patients.*—It is impossible to prophesy with certainty what the effect of irradiation will be in a given case so far as menopausal symptoms are concerned, but these symptoms are usually more pronounced and of longer duration in the highly nervous individual. We believe that in such patients operation with conservation of ovarian function will yield better end-results than irradiation.

12. *Radiophobia.*—We have coined this word as a contraindication because we are not infrequently consulted by patients who have an unwarranted fear of the effects of radium. If we are unsuccessful in

convincing the patient that her fear is unfounded, we choose operation even though the pelvic condition is ideally suited to irradiation. It has been our experience that when radium has been used in spite of this fear, although the pelvic lesion has been relieved, all subsequent ills may be erroneously ascribed to its lasting effects.

It is evident that with close adherence to these contraindications a large number of myomas immediately fall into the operative group. The proof of this assertion is that radium has been employed in only 21.4 per cent of our cases. Reports from our clinic show a steady decrease in the relative number of patients treated by radium. This decline in percentage does not mean that we are losing faith in the method, but rather that the contraindications are being more rigidly observed.

TABLE I. AGE BY DECADES

| | | |
|---------------------------------------|-----|-------|
| Third | 13 | 5.1% |
| Fourth | 82 | 32.2% |
| Fifth | 124 | 48.8% |
| Sixth | 30 | 11.8% |
| Seventh | 3 | 1.2% |
| Eighth | 2 | 0.8% |
| 81% of patients between ages of 30-50 | | |

TABLE II. MARITAL STATE

| | | |
|-----------|-----|-------|
| Single | 58 | 22.7% |
| Married | 196 | 77.3% |
| Parity | | |
| Nullipara | 120 | 47.2% |
| Para | 134 | 52.8% |

TABLE III. STERILITY AND FERTILITY

| | | |
|--|-----|----------|
| Incidence of sterility in married group | | 31.6% |
| One or more children | 125 | 63.7% |
| Miscarriage but no children | 9 | 4.6% |
| Average length of time since last child was born in parous group | | 16 years |
| Total number of pregnancies in group | 450 | |
| Number of miscarriages | 105 | 23.3% |

Radium should never be used without preliminary diagnostic curettage. Thus, valuable information is obtained as to the exact location of the tumor, as well as to the presence or absence of carcinoma of the fundus, and the possibility of an early pregnancy will be eliminated. Carcinoma of the fundus complicated 1.6 per cent of our cases. The excellent work of Murphy proves that postconception irradiation may produce disastrous effects upon the fetus, particularly microcephalic idiocy. One cannot be too careful, therefore, in ruling out pregnancy before adopting irradiation by either radium or the roentgen-ray. Irradiation for pelvic lesions should be either given by a gynecologist

who is familiar with the subject or applied under his direction. Too frequently the gynecologist is not consulted until irradiation has failed to effect satisfactory results in patients ill suited to this method of treatment.

In our analysis we find that there has been a gradual decrease in the dosage of radium. Twelve hundred milligram hours was formerly considered the standard dosage for benign lesions. This was followed by a fairly high percentage of severe menopausal symptoms which constituted the only untoward result. In this series a dosage of 600 to 900 milligram hours has diminished the incidence of severe menopausal symptoms, has satisfactorily controlled the bleeding, and has been followed by reduction in size of the tumors. Should, however, the smaller dosage be insufficient one can safely resort to ambulatory roentgen irradiation since the possibility of corporeal carcinoma has been eliminated by the curettage done at the time radium was applied.

RESULTS OF RADIUM TREATMENT

| | |
|-------------------------------|-------|
| Number of cases irradiated | 50 |
| Number of cases followed up | 48 |
| General end-result excellent | 83.3% |
| Marked improvement | 10.4% |
| Temporarily relieved | 2.1% |
| Unimproved | 4.1% |
| Satisfactory results obtained | 93.7% |
| MENOPAUSAL SYMPTOMS | |
| None | 31.2% |
| Mild | 39.5% |
| Moderate | 14.6% |
| Severe | 14.6% |

Roentgen Irradiation.—A relatively small number of patients (4.7 per cent) were treated by roentgen irradiation. We believe this form of therapy is definitely indicated in certain conditions. This applies particularly to patients with large tumors, or with smaller tumors complicated by chronic adnexitis, who are poor operative risks because of a profound anemia. The bleeding can be controlled by roentgen therapy, appropriate measures can be used to combat the anemia, and if operation is subsequently necessary, it can be performed under more favorable conditions. Many patients so treated will not require operation, but there are others in whom the regression of the tumors is not satisfactory thus making their removal advisable.

Roentgen treatment may be used with comparative safety in tumors associated with chronic adnexitis, but radium often induces an acute exacerbation. Roentgen irradiation is also of value when obesity, pulmonary and thyroid complications or cardiovascular disease contraindicate operation.

As a general rule a diagnostic curettage should precede roentgen therapy, thus eliminating carcinoma and early pregnancy. Occasionally anesthesia in any form is undesirable, and in these cases diagnostic curettage may be safely omitted, provided there is nothing in the history suggestive of carcinoma or pregnancy. Patients should be warned to avoid the possibility of conception in the intervals between roentgen treatments.

Twelve of our patients received roentgen treatment, and in eight of these the chief symptom was marked anemia, the hemoglobin varying from 20 to 40 per cent. In all, the bleeding was controlled at intervals varying from one to six weeks, the tumors have shown marked reduction, and without exception the patients are in perfect health six to eighteen months after treatment.

SUMMARY OF ROENTGEN TREATMENT

| | |
|---|------|
| Number of cases irradiated | 12 |
| Indications: | |
| Severe anemia | 8 |
| Large cervical myoma (poor operative risks) | 2 |
| Submucous myoma | 1 |
| Patient refused operation because of large inoperable tumor | 1 |
| Results: | |
| Control of bleeding | 100% |
| Reduction in size of tumor | 100% |

Two obese patients were given roentgen treatment because of large cervical myomas, the excision of which would have necessitated hazardous operations. Pressure symptoms were the dominant complaints. There has been gradual regression of the tumor in both cases with corresponding decrease in the pressure symptoms, six months following irradiation.

Another patient who refused operation had a large submucous tumor, which contraindicated the use of radium. Gradual reduction of the

TABLE IV. ASSOCIATED PATHOLOGY IN OPERATIVE GROUP (180 CASES)

| | | | |
|---|----|-------|---|
| Cyst of corpus luteum | 42 | 23.3% | In 44.4% of cases there was some demon- strable ova- rian lesion |
| Follicular ovarian cysts | 8 | 4.4% | |
| Dermoid cyst of ovary | 3 | 1.7% | |
| Serous cyst adenoma | 1 | .6% | |
| Pseudomucinous cystadenoma | 2 | 1.1% | |
| Carcinoma of ovary | 2 | 1.1% | |
| Endometriosis (ovarian) | 20 | 11.1% | |
| Parovarian cyst | 2 | 1.1% | |
| Chronic pelvic inflammatory disease | 42 | 23.3% | |
| Hematosalpinx | 2 | 1.1% | |
| Chronic appendicitis | 4 | 2.2% | |
| Acute appendicitis | 2 | 1.1% | |
| Ectopic pregnancy | 1 | 0.6% | |
| Intrauterine pregnancy | 1 | 0.6% | |
| Cervical polypi | 7 | 3.9% | |
| Hemorrhoids | 2 | 1.1% | |
| Pelvic relaxation sufficient to require plastic | 12 | 6.6% | |

tumor, cessation of bleeding and good general health have resulted from roentgen treatment.

The last patient in this group had a tumor filling the abdominal cavity. Operation was attempted, but widespread adhesions incident to a previous myomectomy, and the intraligamentous position of the tumor rendered hysterectomy impossible. She was given roentgen treatment two years ago; the tumor is now one-half its original size, and the patient is free from symptoms.

SURGICAL TREATMENT

The Clark Clinic has always advocated conservatism in the management of uterine myomas. Those of us who have succeeded Dr. Clark believe firmly in the wisdom of his teaching, and this applies with particular emphasis to the surgical treatment where conservation of normally functioning organs should be carried out wherever possible.

We are not in favor of vaginal hysterectomy as a routine procedure, although this operation may be ideal in the occasional patient who presents a small tumor with considerable relaxation of the pelvic floor.

TABLE V. INCIDENCE OF MALIGNANCY IN WHOLE GROUP (254 CASES)

| | | |
|---------------------|---------|------|
| Sarcoma uteri | 2 cases | 0.8% |
| Carcinoma of fundus | 4 cases | 1.6% |
| Carcinoma of ovary | 2 cases | 0.8% |

TABLE VI. MENSTRUAL DISTURBANCES

| | | |
|------------------------------|-----|-------|
| Menorrhagia | 133 | 52.4% |
| Metrorrhagia | 23 | 9.0% |
| Menorrhagia and metrorrhagia | 26 | 10.3% |
| Oligomenorrhea | 2 | 0.8% |
| Amenorrhea | 1 | 0.4% |
| No menstrual disturbance | 69 | 27.1% |

TABLE VII. OTHER SYMPTOMS

| | | |
|-------------------------|----|-------|
| Pelvic pain | 68 | 26.7% |
| Tumor | 53 | 20.9% |
| Backache | 69 | 27.1% |
| Pelvic pressure | 23 | 9.0% |
| Frequency of urination | 41 | 16.0% |
| Sense of weight | 3 | 1.2% |
| Dysuria | 5 | 2.0% |
| Phlebitis (or pressure) | 3 | 1.2% |
| Dysmenorrhea | 26 | 10.3% |

} 29.4% com-
plained of
pressure
symptoms

Obviously vaginal myomectomy is indicated when a pedunculated tumor projects from the cervical canal. In our series only 6 patients (3.3 per cent) were suited to this form of treatment. We have been able to follow the subsequent course in only three of these, and there has been no recurrence of bleeding.

Abdominal myomectomy is unquestionably the ideal operation in the young woman, where it is desirable to maintain her procreative as well as her menstrual functions, but we believe that it is unwise to employ this method unless the preservation of a normally functioning uterus seems assured. Unfortunately in this series relatively few tumors (6.4 per cent) were found amenable to myomectomy.

The end-results were entirely satisfactory in 82 per cent, and in only one was a subsequent hysterectomy necessary. Pregnancy has occurred in none of the eight patients in whom this possibility was conserved.

If hysterectomy is decided upon, two questions at once arise: First, shall the hysterectomy be complete or partial, and second, what shall be the disposition of the ovaries? We realize that the first of these questions is controversial, but we believe that, with few exceptions, supravaginal amputation is the operation of choice. Reports from several clinics indicate that total hysterectomy is not attended by increased mortality or morbidity, but these results do not apply to the operation as performed by the majority of surgeons.

TABLE VIII. TYPES OF DEGENERATION OF TUMORS IN OPERATIVE GROUP (180 CASES)

| | | |
|------------------------------------|----|-------|
| Sarcoma | 2 | 1.1% |
| Cystic degeneration | 34 | 19.0% |
| Calcareous degeneration | 18 | 10.0% |
| Cystic and calcareous degeneration | 6 | 2.2% |
| Hyaline degeneration | 2 | 1.1% |
| Edema | 2 | 1.1% |
| Liquefaction | 1 | 0.6% |
| Carneous or red degeneration | 4 | 3.3% |
| | 69 | 38.4% |

TABLE IX. MENOPAUSAL SYMPTOMS

| | NONE | MILD | MODERATE | SEVERE |
|-------------------------|-------|-------|----------|--------|
| Ablation of ovaries | 7.7% | 55.7% | 9.6% | 26.9% |
| Conservation of ovaries | 81.5% | 12.5% | | 6.1% |
| Radium | 31.2% | 39.5% | 14.6% | 14.6% |
| X-ray | | 41.6% | 16.6% | 41.6% |

TABLE X. BACKACHE

| | CURED | IMPROVED | UNCHANGED |
|-------------------------|-------|----------|-----------|
| Ablation of ovaries | 48.1% | 25.9% | 25.9% |
| Conservation of ovaries | 50.0% | 21.4% | 28.5% |
| Radium (4 cases) | 75.0% | 25.0% | |
| Myomectomy (4 cases) | | 75.0% | 25.0% |

The fact is indisputable that carcinoma of the cervix may develop after a supravaginal hysterectomy, but this is comparatively rare, and we are convinced that the increased mortality and morbidity attendant upon the universal adoption of total hysterectomy would far exceed

TABLE XI. RESULT OF ROENTGEN IRRADIATION IN ANEMIC PATIENTS

| SIZE OF TUMOR | EFFECT OF X-RAY ON BLEEDING | POST X-RAY SIZE OF TUMOR | MENOPAUSAL SYMPTOMS | GENERAL HEALTH |
|---|-----------------------------|--------------------------|---------------------|----------------|
| 3 months | No bleeding | 50% reduction | Severe | Excellent |
| 3½ months | No bleeding | Barely palpable | Mild | Excellent |
| 2½ months | No bleeding | Barely palpable | Moderate | Excellent |
| 3½ months | No bleeding | | Severe | Excellent |
| 5 months | No bleeding | Marked reduction | Mild | Excellent |
| 4 months | No bleeding | Reduced to 3 months | Severe | Excellent |
| 4½ months | No bleeding | Reduced to 3 months | Mild | Excellent |
| 4½ months | Occasional slight spotting | Barely palpable | Severe | Excellent |
| Results based on 6 to 18 months' observation. | | | | |

that incident to subsequent carcinoma of the cervical stump. The incidence of carcinoma can be largely eliminated by cauterization or repair of the diseased cervix as a preliminary step to the supravaginal operation. This is substantiated by the recent statements of Pemberton and Smith that of 669 patients with carcinoma of the cervix none had had a previous cauterization and that in none of 1408 patients whose cervixes had been cauterized has carcinoma been known to develop. Graves states that in 5000 cases of cervical repair, only 4 patients have been known to develop carcinoma, an incidence of less than one tenth of one per cent.

As regards the disposition of the ovaries, our clinic has always advocated conservation when possible, for by so doing distressing menopausal symptoms do not develop or are moderate in severity.

In this series one or both ovaries were conserved in 60.8 per cent. Of these 81.5 per cent did not complain of menopausal symptoms—and in only 6.1 per cent were these symptoms severe. Contrast this with the incidence of 26.9 per cent of severe menopausal symptoms following bilateral oophorectomy.

Ovarian conservation is also important from the standpoint of the preservation of regular menstruation in young women who require a supravaginal hysterectomy. In patients under forty years of age we attempt to conserve sufficient endometrium to permit of regular, though lessened, menstruation. Following this plan regular menstruation has occurred in 17.6 per cent of the patients under menopausal age; in none of these have menopausal symptoms developed, and their general health has been excellent. These results tend to confirm our belief that a complementary relationship exists between the functional activity of the ovaries and the endometrium, and that the maintenance of this relationship promotes the well-being of the individual.

RESULTS IN HYSTERECTOMY GROUP

The results following hysterectomy were satisfactory in 92.5 per cent. Lumbar or sacral backache was noted in 55 cases before operation. Of these patients 49.1 per cent were entirely relieved, 23.6 per cent improved, and in 27.2 per cent there was no improvement so far as backache was concerned.

MORTALITY

In the entire series four deaths occurred, or a total mortality of 1.57 per cent. There were no deaths after irradiation, thus making the operative mortality 2.15 per cent.

Pulmonary embolism was the cause of death in three patients, and autopsy proved the fourth to be due to massive atelectasis of the lower lobes of both lungs, associated with chronic myocarditis. The deaths from embolus occurred on the sixth, eleventh and fourteenth postopera-

tive days respectively. Each of these patients had large tumors, and in two, hysterectomy was extremely difficult because of their intraligamentous position.

SUMMARY

Two hundred and fifty-four cases of myoma uteri are reviewed from the standpoint of treatment and end-results.

Radium was employed in 21.3 per cent with satisfactory results in 93.7 per cent.

Roentgen irradiation was the method of choice in 4.7 per cent, and the results were uniformly good.

Seventy-three and two-tenths per cent were operated upon. The end-results in this group were entirely satisfactory in 92.5 per cent.

There were no deaths following irradiation.

The operative mortality was 2.15 per cent.

CONCLUSIONS

There is no lesion in the pelvis which requires more careful individualization in the choice of treatment than a uterine myoma. Each patient presents a different problem, and the appropriate treatment can be chosen only after judicious consideration of all factors concerned.

Irradiation is not to be looked upon as a competitor of surgery; each has its place in the treatment of myomas; the indications for each method are sharply defined, and the use of one to the exclusion of the other is not to the best interest of the patient.

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133 SOUTH THIRTY-SIXTH STREET.

(For discussion, see page 266.)

McSwiney, B. A.: Is Quinine Induction of Labor Absolutely Harmless? J. Obst. & Gynec. Brit. Emp. 36: 90, 1929.

This is a report of 2 cases in which 30 gr. of quinine was used to induce labor. In each case the fetus did not survive. The first, delivered easily with forceps since fetal heart sounds could not be heard, was born dead, and the second, delivered spontaneously, died 21 hours after birth. No postmortems were obtained. The author wonders whether occasional cases exist which have an idiosyncrasy for quinine and for which the usual dose of 30 gr. is dangerous.

FRANK SPIELMAN.

FUNDAMENTAL BIOCHEMICAL FACTORS IN PREGNANCY*

BY MAX TRUMPER, PH.D., PHILADELPHIA, PA.

AT THE present time it is generally recognized that the metabolism of a pregnant woman is different from that of a nonpregnant woman. If one accepts the premise that pregnancy is a physiologic process, one must realize that such metabolic alterations are likewise to be considered physiologic. It is my purpose to discuss briefly the fundamental biochemical alterations during pregnancy and to attempt to show how variations beyond these physiologic limits may lead to serious complications.

Protein Metabolism.—The normal adult of constant weight is in a state of nitrogen equilibrium, that is, the nitrogen or protein intake is balanced by the nitrogen output. An insight into the terminal stages of protein metabolism may be gained by examining the nitrogenous constituents of the blood. The most important of these are: urea nitrogen 12 to 15 mg. per cent; uric acid 2 to 3.5 mg. per cent; creatinine 1 to 2.0 mg. per cent; amino acids 5 to 8.0 mg. per cent; ammonia nitrogen 0.1 to 0.2 mg. per cent, and other constituents of less importance. In addition there is the undetermined nitrogen fraction which in the opinion of some authorities is of prime importance in certain abnormal conditions. *The sum total of these nitrogen compounds comprises what is termed the total nonprotein nitrogen, which ranges normally from 25 to 35 mg. per 100 c.c. of blood.*

The end-products of nitrogen metabolism are represented by the appearance of these same substances in the urine, but of course in different concentrations.

Protein Requirements in Pregnancy.—The pregnant woman, in contradistinction to the nonpregnant woman, is not in nitrogen equilibrium, her nitrogen output being less than her intake. In other words she is in a state of positive nitrogen balance. The reason for this is apparent from the fact that the pregnant woman must satisfy the requirements of the growing fetus in addition to those of her growing body. Near the end of pregnancy this positive balance is reduced since the demand for nitrogen by the fetus is diminished.

The intermediate protein metabolism as evidenced by extensive studies of the nitrogenous constituents of the blood is but little altered during pregnancy. *There is a slight diminution in urea nitrogen, balanced by a slight increase in amino acids and ammonia nitrogen. There is also a constant but slight increase in uric acid.* A very important variation

*Read before The Obstetrical Society of Philadelphia, Feb. 6, 1930.

from the normal is encountered in a study of the plasma proteins. Normally the ratio of albumin to globulin is about three and one-half to one, fibrinogen existing in very small amount. During pregnancy, beginning about the third month there is a diminution in plasma proteins which is due almost entirely to a decrease in the albumin fraction. This results in a relative increase of globulin and fibrinogen, the latter being increased much more than the former.

Urinary findings with regard to protein metabolism in pregnancy differ but slightly from these findings in the nonpregnant state. There is a slight decrease in the output of urea and a corresponding rise in amino acids and ammonia.

Fat Metabolism.—Alterations in fat metabolism occur during pregnancy but the significance of these changes is difficult to determine. *It is definitely established that there is an increase in the concentration of cholesterol and other lipoids* as well as of total fat in the blood. Too little is known concerning the metabolism of cholesterol to enable us to interpret these findings to practical advantage. *One very important deviation* from normal fat metabolism is generally recognized as occurring in pregnancy, namely a distinct tendency toward a state of mild ketosis. This is evidenced by the excretion of acetone bodies as a result of diets which would not produce this result in the nonpregnant woman. This will be discussed in greater detail in the consideration of acid-base equilibrium.

Carbohydrate Metabolism.—Obviously under the conditions of normal pregnancy, providing as it must for the constant growth of the fetus, a distinct alteration in the carbohydrate requirement must take place. Whether or not there occurs any disturbance of carbohydrate metabolism, it is difficult to say; if it does occur, it is in all likelihood more in the nature of a quantitative than a qualitative change. We do know that in many cases there is an excretion of sugar in the urine. This occurs without any increase in the concentration of glucose in the blood, and in the opinion of most investigators is due to a decrease in the renal threshold for glucose rather than to any actual disturbance in carbohydrate metabolism. In other words the permeability of the kidneys is increased, constituting a state analogous to that of renal diabetes. One must remember that not all sugar found in the urine is glucose. Particularly in the later months of pregnancy and during lactation, lactose is apt to be excreted in the urine. Most observers report an increase in the lactic acid content of the blood and urine. This is evidence of some interference with the complete combustion or resynthesis of glycogen in the tissues, but the exact mechanism underlying this increase is debatable.

Acid-Base Equilibrium.—There is a definite tendency toward a mild acidosis in pregnancy, beginning in the early months and persisting throughout. This acidosis is in all probability a compensated one, the

actual H-ion concentration of the blood changing only in the last weeks of pregnancy. Therefore the statement may be made that normal pregnancy is associated with a state of relative and not actual acidosis. This state is evidenced by the following laboratory findings: a decrease in the alveolar CO_2 tension, decrease in the CO_2 combining power of blood plasma, increase in the excretion of lactic acid and ammonia in the urine and by the elimination of acetone bodies. The cause of this acidotic tendency is not definitely known. Most investigators attribute it to a depletion of the alkali reserve incident to the increased production of acetone bodies and lactic acid.

Calcium Metabolism.—It has long been recognized that the pregnant state is associated with some alteration in calcium metabolism. This has been emphasized particularly because of the association of osteomalacia and tetany with pregnancy. This relationship has been exaggerated but it nevertheless is a factor of importance. During the twenty-eighth week the fetus contains only about $5\frac{1}{2}$ gm. of calcium. At the fortieth week there are 30.51 gm. of calcium. As pointed out by Hess, the loss of 5 gm. from the bones of an adult to build up the fetal skeleton could not possibly cause osteomalacia which usually begins before the seventh month of pregnancy. This effect is strongly suggestive of some endocrine action. It is of interest to note that Aub found the calcium balance in early and late pregnancy to be practically identical with that of the nonpregnant state, when maintained on low calcium intake.

The serum calcium tends to diminish as pregnancy progresses, this diminution being very rarely beyond the lower limit of normal. This finding, in the light of modern knowledge concerning calcium metabolism is strongly suggestive of a condition of hypofunction of the parathyroids, which may be associated with the hyperfunction of the thyroid which exists during pregnancy. The susceptibility to tetany likewise points toward this premise. However, it is believed at present that osteomalacia is more frequently associated with hyperfunction of the parathyroids than with hypofunction. These conflicting facts are difficult to reconcile. One must remember that the subject of calcium metabolism is an extremely intricate one and that the complete story may not be told by the level of serum calcium. The partition of calcium into diffusible and nondiffusible fractions is perhaps of more importance than the absolute level of calcium in the blood, since the ratio between these two fractions affords an insight into the distribution of physiologically active calcium in the tissues. Investigation in this direction is needed to throw more light upon the subject.

Basal Metabolism and Endocrines.—The basal metabolism increases gradually during the latter half of pregnancy. The average basal metabolic rate at term being approximately plus 20 per cent. This increased metabolism is not accounted for by the increase in weight

and must represent an endocrine action. The hypophysis is hypertrophied which increases metabolism. The other internal secretions capable of producing this metabolic alteration are thyroxin and adrenalin.

Water and Sodium Chloride Balance.—It seems well established that blood volume in the later months of pregnancy is increased. This increase is due to an increase in plasma volume and is associated with a corresponding decrease in specific gravity and in the percentage of hemoglobin and red cells. The serum proteins are likewise diluted in addition to the actual diminution in serum albumin. There is no unanimity of opinion as to the actual volume of blood in pregnancy. Blood studies on sodium chloride have been disappointing and are of no diagnostic value. We do not as yet understand the factors concerning the salt and water balance in pregnancy.

ECLAMPSIA

Biochemical studies in eclampsia have thrown but little light upon this condition. It is remarkable that with all the methods of study at our disposal at the present time, a disorder like eclampsia, characterized by severe, indeed fulminating clinical manifestations, should reveal such slight metabolic alteration.

Opinion is divided with regard to the condition of protein metabolism in eclampsia. The belief of the majority of investigators may be summed up as follows: The total nonprotein nitrogen, urea nitrogen, and creatinine are but slightly affected; uric acid is increased to a moderate degree; amino acids and ammonia are likewise increased above normal limits. None of these changes can in any way be considered of fundamental importance in throwing light upon the mechanisms concerned. The only factor which may perhaps be of significance is the undetermined nitrogen fraction. In many cases of eclampsia this is remarkably increased. However, in other cases it is within the normal limits and conversely in clinical conditions other than eclampsia it may be increased with no attending symptoms.

Carbohydrate.—The question of carbohydrate metabolism in eclampsia has been intensively investigated. It is curious that opinion can be divided concerning so absolute a factor as the level of blood sugar. However, it is about this very point that discussion centers. Titus and his followers maintain their belief in the constant occurrence of hypoglycemia during eclampsia and insist upon this factor as of fundamental importance. On the other hand Stander and his school just as firmly insist that the blood sugar in eclampsia, if altered at all, is increased. The majority of authors seem to adhere to the latter opinion. However it seems to me that the nutrition of the patient and the severity of the symptoms both prior to and during the stay in the

hospital have a distinct bearing upon the amount of glycogen reserve and upon the level of blood sugar.

Acid-Base Equilibrium.—As was previously stated during normal pregnancy there is a compensated acidosis. In eclampsia the acidosis becomes uncompensated, there being a shift in H-ion concentration of the blood toward the acid side. However this state of acidosis in itself cannot be considered a primary factor in the production of this condition since we all know that acidosis may be marked in other clinical states entirely dissimilar to eclampsia.

Calcium.—The majority of reports concerning serum calcium in eclampsia indicate that it is decreased below the level normally found during pregnancy. However this finding cannot in itself be considered of great significance since the diminution is not marked and the symptoms are unlike those ordinarily associated with slight reduction in serum calcium. As emphasized before it must be remembered that the level of serum calcium is not always a true index of the state of calcium metabolism. One must take into consideration the ratio of the diffusible to the nondiffusible and of the ionized to the nonionized fractions before any definite conclusion can be arrived at. As shown by several workers there may exist a very definite disturbance in calcium metabolism, with serious clinical manifestations yet with no change in the level of total serum calcium. The importance of inorganic metabolism in physiology is gradually coming into recognition. As our knowledge in this field increases we come to appreciate more deeply the intricate and delicate interrelationships between the metabolism of inorganic elements and of organic substances. In this connection the recent work of Minot and Cutler working with Lamson makes a most valuable contribution and is a step in the right direction toward the solution of many of the problems which concern us in considering the biochemical mechanisms underlying eclampsia. These investigators found in a group of conditions characterized by acute liver damage, both experimental and clinical and including eclampsia, certain constant changes. These consisted essentially of an increase in the amount of guanidine in the blood and a diminution in the level of blood sugar. The serum calcium was unaltered. The toxic symptoms appeared to be related to the degree of guanidine retention. To my mind* the most important and significant feature of their work was the fact that the intravenous injection of calcium salts brought about prompt relief from these symptoms, at the same time causing a return of the blood sugar to normal levels. The administration of glucose brought about a return of normal blood sugar without any relief from symptoms thus indicating that the disturbance in blood sugar although an associated factor, is not the one fundamentally involved. The most

*The forms of calcium most satisfactory for intravenous use are calcium gluconate (Sandoz) and calcium chloride.

significant factor appears to be the increased concentration of guanidine. For many years the relationship between guanidine intoxication and disturbed calcium balance has been recognized. It appears from previous works as well as that of Minot and Cutler that calcium exerts its beneficial effect upon the symptoms of guanidine intoxication by some antagonistic influence which it exerts upon that substance.

Until comparatively recently our investigations of the nature of eclampsia were directed toward the study of organic metabolism. In the past few years inorganic metabolism has come to the front. Bland and Bernstein have reported on the advantages of a salt-free diet and its effects on actual loss of fluid from the tissues. Today we know that NaCl and NaHCO₃ increase edema. It appears likely that our increasing understanding of the principles underlying the metabolism of inorganic elements and their relation to the fundamental physico-chemical mechanisms operating under normal and pathologic conditions will throw more light upon certain clinical disorders, the nature of which at the present time is obscure.

921 MEDICAL ARTS BUILDING.

(For discussion, see page 272.)

Faehrmann: Creation of an Artificial Vagina Out of the Sigmoid Flexure. *Zentralbl. f. Chir.* 56: 989, 1929.

There are two prevailing methods of creating an artificial vagina: (1) out of small intestine, (2) out of the rectum. Faehrmann, in a case of vaginal aplasia in a young girl, used the sigmoid flexure. He excluded the mobile portion of the sigmoid, thus securing a blind portion of the gut, and reestablishing the continuity of the sigmoid by lateral anastomosis. Next he separated the bladder from the rectum and crowded the excluded loop of the sigmoid down into the pelvis, leading it out of the vulva. The technic is described in detail, special emphasis being laid on the preservation of the circulation of the intact and resected portions of the sigmoid.

SEELIG.

Gausman: The Uniting of Two Graafian Follicles. *Russk. Klin.* 11: 221, 1929.

The author studied the ovary of a girl, fifteen years old, dead from acute endocarditis. Menarche at thirteen years flows regularly, four weeks' interval and three days' duration, but had been amenorrhoeic for last four months. In a series of sections, he found four places where two follicles were united to each other. At one place the granulosa of a ripening follicle was seen joined to the granulosa of an adjacent small follicle. Each follicle contained an ovum with clearly visible nucleus and nucleolus. The author feels that by means of this process of uniting of two follicles finally one follicle is formed containing two ova.

ALEXANDER G. GABRIELIANZ.

A REVIEW OF THE PROGRESS IN ENDOCRINOLOGY OF INTEREST TO THE GYNECOLOGIST AND OBSTETRICIAN*

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(Gynecologist to Mount Sinai Hospital)

THE progress made in the theoretical field of endocrinology has been startling and epochal. This progress applies likewise to our methods of diagnosis. Therapeutics has not kept pace with these advances, but the future promises much.

The gynecologist and obstetrician are mainly interested in such advancements as apply more directly to their fields. Every branch of medicine has been benefited by the discovery of Banting, Best and Collip of insulin and by the practical application of this wonderful agent. The literature bearing upon insulin has already reached prodigious proportions and requires no further discussion. The parathyroid hormone, isolated in an impure state by Collip, rarely is applicable to our field except in tetany and osteomalacia, both unusual and rare diseases.

Of more immediate interest are the advances made in the study of the female sex hormone and the pituitary gland. It is upon these two phases of the subject that I shall concentrate my remarks.

Proof that menstruation is due to the female sex hormone has been given by Allen and Pratt,¹ and Corner.² These investigators showed that in castrated primates (rhesus monkeys) injection of female sex hormone and abrupt withdrawal of the same are followed by typical menstruation. The injection of the hormone brings the uterus into the condition of premenstruation or pregravidity; its withdrawal is followed by the menstrual flow. This demonstration is clear-cut and convincing.

Proof that the corpus luteum secretes two hormones has been offered by my collaborators (Gustavson, Goldberger and McQueen) and myself,³ by obtaining from the same batch of corpora lutea the female sex hormone which gave all the usual tests, as well as the nidatory hormone. The presence of this latter hormone can be demonstrated in several ways. We were able to produce loosening of the pubic ligaments in virginal guinea pigs in a period of twelve hours by injecting the aqueous extract of the corpus luteum. The female sex hormone is obtained by lipid (ether) extraction, the nidatory hormone by aqueous extraction.

Proof that the anterior pituitary lobe secretes a hormone activating the ovary has been offered by Philip Smith,⁴ with repeated implants of fresh anterior lobe, as well as by Aschheim and Zondek,⁵ who em-

*Read at the meeting of the New York Obstetrical Society, March 11, 1930.

ployed an extract of the anterior lobe. Implantation or injection into immature animals produces puberty, causes massive and rapid growth of follicles in the mature, and reactivates the ovaries if senility has already ensued (Steinach and Kun⁶). Thus the anterior lobe is shown to cause puberty. The work of Evans and Simpson⁷ has demonstrated that the anterior lobe secretes at least two hormones, the one producing a general somatic growth. This hormone is elaborated, according to these authors by the eosinophilic cells, while the special gonadal stimulant is supposed to be derived from the basophilic cells. By means of excessive exhibition of the gonadal anterior lobe hormone superovulation and superfetation to an astounding degree, can be brought about.

Excess excretion of the anterior lobe hormone as well as of the female sex hormone in the urine of pregnancy has been demonstrated by Aschheim and Zondek.⁸ The excess produced is amazing. As much as 10,000 M. U. per liter (a mouse unit represents the amount of female sex hormone necessary to produce full estrus in a castrated mouse) has been excreted in twenty-four hours. Because of this excess production, the urine of pregnant women has been used in all the later investigations for the isolation of the female sex hormone.

Crystalline female sex hormone was announced in August, 1929, by Doisy.⁹ Since then Butenandt of Göttingen has likewise obtained a crystalline product from the urine of pregnancy. According to newspaper reports, the original article not being available to me at the moment, Collip has obtained the same crystalline product from the placenta. Butenandt believes that the hormone will prove to be related to the stearates. My collaborator, Gustavson, more than a year ago, found evidence pointing to the fact that the hormone is a gamma lactone. We may soon expect to obtain the chemical formula as well as the structure of this important hormone.

The widespread presence of the female sex hormone should be kept in mind. In small quantities it has been demonstrated in yeast (Fellner,¹⁰ Frank and Goldberger¹¹); in greater quantity it can be found in the ovaries as well as in other portions of many plants (Loewe¹²). In mammals it has been demonstrated in the follicle fluid (Frank,¹³ Allen and Doisy¹⁴); in the corpus luteum (Aschner,¹⁵ Fellner¹⁶); in the placenta (Iscovesco¹⁷); in the blood (Loewe,¹⁸ Frank, Gustavson, Frank, and Weyerts¹⁹); in the urine of normal women (Loewe²⁰), as well as of pregnant women (Aschheim and Zondek⁸); in the feces (Dohrn and Faure²¹); in the bile (Gsell-Busse²²); in the blood of males and in other tissue fluids. My own hypothesis is that the female sex hormone first produced general tissue growth but later became more specialized, and finally its effect has become limited to the genital tract and the breasts. Its appearance in the bile of both sexes, as well as its appearance in the blood and urine of males, appears accounted for by absorption from the intestinal tract. Together with Goldberger I

have obtained evidence that the liver takes up the circulating female sex hormone and stores it in the gall bladder. When this viscus empties, rapid reabsorption appears to occur, with temporary flooding of the circulating blood. As the female sex hormone has a distinctly anti-masculine effect (Laqueur²³), the *raison d'être* for this protective mechanism is accounted for. The average potato, for example contains from 1 to 2 mouse units of female sex hormone.

Three types of menstruation. The work of Gebhard,²⁴ Schröder,²⁵ Heape²⁶ and Corner,²⁷ has shown that menstruation takes place through the endometrium under different conditions.

The commonest form is that of Schröder in which a marked pregravid reaction occurs, the endometrium being divisible into three layers, a superficial compact layer, a spongy layer, these two being called the functional layers, and an unchanged narrow basilar layer. At the time of menstruation the functional layers are cast off, and the narrow, exposed basilar layer alone remains. Through this open wound which resembles the uterine lining postpartum, the blood sickers.

Gebhard showed that in a certain number of cases, although the functional pregravid changes occur, the hemorrhage takes place by diapedesis as well as the formation of superficial hematomata without great loss of substance.

Heape in 1899, as well as Corner more recently, called attention to the fact that in the macacus and *Simnepithecus entellus* type of monkeys, menstruation may occur through an unchanged endometrium by diapedesis.

How to account for these three mechanisms, I am unable to state at present.

DIAGNOSIS

Aschheim and Zondek have utilized the excess excretion of anterior lobe hormone in the urine to devise a very accurate test for pregnancy. Small amounts of untreated urine are injected in five small quantities into immature mice or rats. In one hundred hours, if pregnancy exists, these animals mature, and blood spots, readily recognizable macroscopically, are found in the ovaries. This test gives 95 per cent of positive results macroscopically. Its sole drawback is that one hundred hours must elapse before the readings can be made. Moreover the demand for immature mice exceeds the available supply.

Estimation of the amount of female sex hormone circulating in the blood is now feasible (Frank and Goldberger²⁸). By this means the concentration present at any time in the blood can be demonstrated. This is of particular importance in evaluating functional amenorrhea, premenstrual "tension," the diagnosis of obscure tumors (fibroids vs. pregnancy), whether the fetus is alive or dead, etc. Our studies have been confirmed by Hirsh,²⁹ Mazer and Hoffman,³⁰ Siebke,³¹ and in some particulars by Janney.³²

Demonstration of the female sex hormone in the urine has been utilized by us (Frank and Goldberger³³) to determine the excretory threshold of the hormone. It appears that in a number of conditions, particularly of amenorrhea and sterility, an unduly low excretory threshold nullifies an otherwise normal production of the hormone. Further studies along these lines are being pursued by us. These investigations demonstrate that the effect to be expected from ovarian action, as well as from ovotherapy, may be nullified by this abnormal renal permeability.

I desire once more to emphasize that today the proper evaluation of an endocrine condition entails much laborious investigation.

The pituitary function is difficult to estimate. As aids, x-ray pictures of the sella turcica, the sugar tolerance of the patient, the development of the aera must be taken into consideration.

Thyroid function can be readily estimated by the basal metabolism, but some thyroid symptoms are not fully accounted for by the rate of metabolic exchange.

Adrenal function is most difficult to estimate. Disturbances of this gland may show themselves by pigmentation and hirsutes. Diminished function is recognized under the general symptoms of Addison's disease.

The adrenal medulla apparently, to some extent, governs the blood pressure, but much obscurity yet obtains.

Parathyroid function is recognized by the level of the circulating calcium as well as by the response of nerves to stimulation.

The pancreatic function is readily studied by the blood-sugar level and the permeability of the kidneys to dextrose.

TREATMENT

The purely mechanistic treatment of sterility and amenorrhea has been exaggerated. By this I do not desire to suggest that, particularly in sterility, mechanical permeability is not of utmost importance, but in the absence of previous infection this etiologic factor rarely obtains. Therefore, the present tendency to overlook evident and striking endocrine disturbances cannot be too strongly emphasized.

Functional sterility is of frequent occurrence in the sterile group. Infantilism, obesity, overt and serious endocrine diseases, such as acromegaly, Froehlich's syndrome, and serious systemic diseases are often at fault. Amenorrheas fall into two groups. The first and most serious shows absence of cyclical function. The second shows greatly diminished ovarian cyclical function or undue renal permeability to the hormone. Many amenorrheic patients are also obese. Without the female sex hormone test of the blood and the urine, I am unable to distinguish between these two groups, the prognosis and treatment of which differ greatly. Obesities require slow and careful reduction of weight. In the presence of cyclical ovarian function "stimulating"

radiation of the ovaries is indicated. It is, however, strongly contra-indicated in the amenorrheas showing no cyclical ovarian activity.

Menorrhagia and metrorrhagia of functional origin are difficult to interpret unless evident endocrine diseases, blood dyscrasias, or other recognizable causes (such as fibromyomas, malignancies, subinvolution, etc.) can be determined and in the absence of such causes may be due to overfunction of the ovaries. We have been able to demonstrate such excess function in only a small percentage of cases. The value of this demonstration is, therefore, almost negligible. This is of little importance, as the treatment of both organic and functional metrorrhagia and menorrhagia is identical. As heretofore, certain drugs may prove of value. Repeated curettages, ovarian irradiation, or intrauterine radium, rarely, resection of the ovaries may be employed.

Menopause symptoms resist treatment to a great degree. The vaginal administration of female sex hormone affords relief in a limited number of instances.

Organotherapy. In spite of the advances in physiology, organotherapy continues to prove disappointing. The available female sex hormone is of little use. All the samples titred by me have continued to show but little and very transient activity. The hypodermic preparations frequently produce unpleasant local reactions. Some of them also cause systemic symptoms of disturbing nature. None of the anterior lobe preparations are as yet suitable for human use. From what we have learned in the past, I feel more and more that our future hopes must be concentrated upon the anterior lobe preparations, which are the motors of the ovaries, as Zondek and Aschheim aptly term them, rather than upon the female sex hormone which stimulates the tubular tract without influencing the ovaries themselves.

Our present methods of therapy, therefore, have not changed greatly. Our hopes should, therefore, be pinned upon general measures, remembering that of the organotherapeutic preparations thyroid extract, insulin and parathyroid hormones are our mainstays. For special purposes, adrenalin and pituitrin are indicated.

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10 EAST EIGHTY-FIFTH STREET.

(For discussion, see page 265.)

FRANK TEST FOR THE FEMALE SEX HORMONE

A REPORT OF A STUDY MADE AT THE WOMAN'S HOSPITAL

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ROBERT T. FRANK in a recent monograph describes substantially the following characteristics of what he calls the female sex hormone. It is abundantly present in follicular fluid, in the corpus luteum, and in placental tissue. When injected into spayed rodents it will induce estrus. It can be demonstrated in the blood of normal women from one to five days before menstruation. During the menstrual period it disappears, or cannot be demonstrated; it is again demonstrable in the week before the next menstrual flow. It can be demonstrated in the blood of some women with amenorrhea: in these cases the occurrence of the hormone may follow a definite cycle, or it may occur irregularly. In other cases of amenorrhea, presence of the hormone cannot be demonstrated. In cases where, due to congenital anomalies, the sex of the individual is undetermined, demonstration of this hormone's presence is valuable, since a positive test implies ovarian function.

Demonstration of this hormone, or of its absence, seemed applicable not only to cases of amenorrhea, but also to those cases of sterility apparently due to functional endocrine disorders not accompanied by amenorrhea. With this idea in mind, we used Frank's test for the hormone on a series of 21 cases selected at the clinic of the Woman's Hospital, at the direction of the chief surgeon.

Technic.—There are 40 c.c. of blood withdrawn from a vein and mixed with 30 gm. of anhydrous sodium sulphate until dry. The mixture is then pulverized and for ten minutes shaken with 125 c.c. of ether. This mixture is allowed to settle; then the ether is decanted into an evaporating dish. The sludge is again shaken with 75 c.c. of fresh ether; the ether is again allowed to settle; the ether is de-

Thanks are due Dr. Frank and his assistant Dr. Goldberger for their kindness in permitting me to learn the technic by observation of the methods used in their laboratory. Their advice was of the greatest assistance.

canted and added to that previously decanted. After the ether has evaporated, the residue is dissolved in 2 c.c. of sterile water and injected, by divided doses, into a female mouse that has been spayed at least ten days previously. Vaginal smears from the mouse are examined in twenty-four, forty-eight, and sixty hours. A negative smear shows only mucus and polynuclear leucocytes; a strongly positive smear shows only cornified epithelial cells; intermediate stages show nucleated epithelial cells in varying numbers, as well as cornified cells.

Of the 21 cases studied, 12 patients complained chiefly of sterility. Each of these cases had been previously examined for pelvic abnormalities. The fallopian tubes had been insufflated by Rubin's method and found patent (except in the case of congenital absence of the vagina). In each case the husband had been examined by a urologist and pronounced fertile. In other words, no definite cause for the sterility other than a possible endocrine disturbance could be demonstrated.

Some of the cases studied had scanty or irregular menstruation. Others had amenorrhea for varying lengths of time. One had an excessive menstrual flow. In the cases of amenorrhea the test was repeated at intervals of about a week to determine whether there was a cycle. When the occurrence of menstruation was predictable, a specimen of blood was tested in the week preceding the expected flow.

Two normal women who had borne children and several pregnant women were tested as controls. The blood of the normal women gave definitely positive reactions preceding the menstrual flow and negative reactions following it (Cases 16 and 17). The pregnant patients, who were in the sixth month or later, invariably gave strongly positive reactions.

In the sterility cases, even when menstruation was regular, there was a great variety in the results obtained, as evidenced by the following records.

CASE 1.—Aged twenty-five. Chief complaint: amenorrhea two months, last regular period April 19, 1928. Blood taken June 12, 1928 was strongly positive.

The strongly positive reaction in this case could mean that menstruation was about to occur, or that the patient was pregnant. Menstruation did not occur, and pelvic examination later showed a definitely pregnant uterus.

CASE 2.—Pregnant seven months. Blood hormone test strongly positive.

CASE 3.—Pregnant six months. Blood hormone test strongly positive.

CASE 4.—Pregnant eight months. Blood hormone test strongly positive.

This agrees with Dr. Frank's finding that the test is positive in the latter months of pregnancy.

CASE 5.—Aged twenty-five. Chief complaint: sterility. Married three years. Menses irregular with occasional periods of amenorrhea. Blood taken June 28, 1928, and July 13 and 18, 1928, was negative. Menstruated July 25, 1928. Blood taken Aug. 1, 1928, was doubtful. Six doses of stimulating x-ray were given at weekly intervals, beginning Aug. 8, 1928. Blood taken Oct. 31, 1928, was positive. Menstruated Nov. 2, 1928.

This case shows a slightly positive reaction both preceding and following a

scanty menstrual period. The premenstrual reaction was stronger after the course of x-ray treatment although the flow was not increased.

CASE 6.—Aged twenty-nine. Chief complaint: secondary sterility, scanty menses. Married ten years. She had an induced abortion at three months ten years ago. Blood taken June 27 and July 2, 1928, was negative. Menstruated July 6, 1928. Blood taken July 18, 1928, was positive and July 25, 1928, was negative.

This patient, fertile ten years ago, with regular although scanty menses, gives a positive reaction following menstruation rather than preceding it. It may be that this reversed relation of menstruation to the appearance of the hormone in the blood is a cause of sterility in some women.

CASE 7.—Aged twenty-five. Chief complaint: secondary sterility, irregular menses. She had three spontaneous abortions at three months, the last one in 1925. She has marked hirsutes. Blood taken July 12, 1928, was negative. Menstruated July 14, 1928. Blood taken July 18 and 25, 1928, was negative. Menstruated Sept. 5, 1928. Blood taken Oct. 11, 1928, was negative.

The test is negative both before and after menstruation. It is probable that the hormone is in the blood in insufficient quantity to give a reaction when tested. Since she has been pregnant, although unable to carry beyond three months, it is possible that the hormone may have been present in larger quantities, yet insufficient to permit further development of the fetus.

CASE 8.—Aged thirty. Chief complaint: primary sterility, amenorrhea from February to June, 1928. Menstruated June 26, 1928. Next period expected July 12, 1928. Blood taken July 18, 1928, was negative. Menstruation did not occur.

A course of 6 doses of stimulating x-ray was given, after which she menstruated more regularly. Further blood tests were not obtained.

CASE 9.—Aged twenty-nine. Chief complaint: primary sterility, amenorrhea for the past five years. Blood taken Aug 1, 1928, was positive, Aug. 6 and 13 was negative, Aug. 21 was positive.

A definite twenty-one day cycle is present although not followed by menstruation. This may be considered a subthreshold type in which the hormone is present but insufficient to be followed by menstruation.

CASE 10.—Aged twenty-seven. Chief complaint: primary sterility. Irregular, scanty menses. Blood taken Oct. 3, 1928, gave a positive reaction. Menstruated Oct. 8, 1928. Blood taken Oct. 29 and Nov. 5, 1928, was negative. Menstruation was expected Nov. 10, 1928, but did not occur. Blood taken Nov. 10, 1928, was negative.

Blood taken five days preceding menstruation gave a positive reaction, but that taken four weeks later, preceding the time menstruation was expected, gave a negative reaction. Menstruation did not occur following this test. This indicates the relation between the appearance of the hormone and menstruation described by Dr. Frank, which has not been apparent in most of these cases.

CASE 11.—Aged thirty-eight. Chief complaint: amenorrhea for four months. Blood taken Oct. 22 and 29, 1928, was negative. Menstruated Nov. 4, 1928. Blood taken Dec. 3, 1928, was negative.

The first blood test was negative seven days before menstruation. If the test had been repeated before the menstrual period, it might have been positive, although it was again negative Dec. 3, 1928, two days before the next period which began Dec. 5, 1928. The negative test in conjunction with the apparent senility of the pelvic organs favored a diagnosis of early menopause in this case.

CASE 12.—Aged twenty-seven. Chief complaint: primary sterility. Married four years. Menses regular, normal. Last menstruation Nov. 1, 1928. Blood taken Nov. 27, 1928, was negative. Menstruation did not occur at the expected time.

Pelvic examination a few weeks later showed this patient to be pregnant. The test was negative four weeks after the last menstruation. Positive tests are expected later in pregnancy. During the first three months of pregnancy the test is unreliable although it may be suggestive as in Case 1, which gave a strongly positive reaction at eight weeks.

CASE 13.—Aged thirty-one. Chief complaint: amenorrhea for five years. Menses always irregular. Married eleven years. No pregnancies. Blood taken Nov. 20, 1928, was negative.

Further tests were refused.

CASE 14.—Aged thirty-three. Chief complaint: primary sterility, menorrhagia. Married five years. Blood taken Jan. 2, 1929, was negative. Menstruated Jan. 4, 1929, profuse. Blood taken Jan. 28, 1929, was negative. Menstruated Jan. 29, 1929, profuse. Blood taken Feb. 4, 1929, was negative.

Although menstruation was regular and profuse, the hormone could not be demonstrated in the blood either preceding or following the period. A few weeks later the uterus was curetted to determine the cause of the menorrhagia. The curettings showed only a moderate hyperplasia. The menstrual flow has been normal since the operation but pregnancy has not occurred. Postcoital examination of vaginal and cervical secretions showed no abnormal physical or chemical inhibitions of the spermatozoa. Since the menstrual function is now normal, although formerly profuse, there seems to be no relation between the demonstrations of the hormone and the occurrence of menstruation.

CASE 15.—Aged thirty. Chief complaint: amenorrhea for seven years following a normal pregnancy. Blood taken Jan. 14, 1929, was negative; Jan. 21, 1929, was doubtful; Jan. 28 and Feb. 4, 1929, was negative.

The hormone is present but in subthreshold amounts. Stimulating x-ray treatment was tried with no improvement.

CASE 16.—Aged twenty-nine. No complaints. Menses regular, normal. Normal pregnancy two years ago. Blood taken March 21, 1929, was negative (only 30 c.c. of blood were obtained). Menstruated March 25, 1929. Blood taken April 16, 1929, was negative; April 22, 1929, was positive. Menstruated April 24, 1929.

In this case, a normal control, the blood was positive two days preceding the menstrual period when a full 40 c.c. were tested. At the first attempt, four days preceding a period, only 30 c.c. of blood were obtained, which was insufficient to produce a positive reaction.

CASE 17.—Aged twenty-four. Chief complaint: total amenorrhea, dyspareunia. Married five months. Examination showed total absence of vagina and uterus. The secondary sex characteristics were feminine, and desire apparently normal. Blood taken Feb. 14, 1929, was negative; Feb. 18, 1929, was strongly positive, and Feb. 25, 1929, was negative.

Tests were done at an interval of a few days, the first was negative, the second strongly positive, and the third negative, showing an intermittent discharge of the female sex hormone into the blood stream presumably from ovarian tissue somewhere in the body.

CASE 18.—Aged thirty-two. Chief complaint: primary sterility. Married six years. Menses regular but scanty. Blood taken Feb. 18, 25, and Mar. 4, 1929, was negative. Blood taken Mar. 11, 1929, was strongly positive. Menstruated Mar. 13, 1929.

The hormone was strongly positive in this case although menstruation was scanty. It was only demonstrable a few days before the menses occurred, although the test was repeated at weekly intervals for the month.

CASE 19.—Aged twenty-nine. Chief complaint: primary sterility, scanty menstruation. Married three years. Blood taken Feb. 1 and 25, 1929, was negative. Menstruated Feb. 28, 1929. Blood taken Mar. 1, 1929, was negative.

Although blood was taken only three days before the menstrual flow, it gave a negative reaction. This is in marked contrast to the preceding case (Case 18) which is otherwise similar.

CASE 20.—Aged twenty-three. Chief complaint: primary sterility, amenorrhea for eight months. Blood taken Mar. 4, 12, 19, and 26, 1929, was negative.

A definite insufficiency of the hormone.

CASE 21.—Aged thirty. No complaints. Two normal pregnancies, the last one in 1927. Blood taken April 15, 1929, was positive. Menstruated April 17, 1929. Blood taken April 29, 1929, was negative.

A normal reaction in a normal control, positive preceding menstruation, negative following.

SUMMARY

Frank's test for the female sex hormone in the blood was done on a series of 21 cases. Of these cases, 12 of the patients complained chiefly of sterility, with or without menstrual irregularities. Four complained of amenorrhea varying from two months to seven years in duration. Three pregnant and two normal women were tested as controls.

The blood of the normal women gave positive reactions preceding menstruation and negative reactions following it. The pregnant cases, in the sixth month or later, invariably gave strongly positive reactions. This is in accord with Dr. Frank's findings.

In the cases of sterility and amenorrhea, there was a great variation in the results obtained. There were five cases of sterility with regular menstruation. Three of these gave negative reactions to repeated tests. One later proved to be four weeks pregnant at the time the test was made. One gave a positive test preceding menstruation; another was positive only after the flow.

There were four cases of sterility with irregular menstruation. Of these, two gave negative reactions to each test; one was positive before the flow; one gave a slightly positive reaction both before and after the flow.

Of the cases of amenorrhea, one with a strongly positive reaction was eight weeks pregnant. Two had definite cycles when a positive reaction was obtained although negative at other times. One gave a slightly positive reaction on one test. Three gave negative reactions whenever tested.

Stimulating x-ray therapy was tried in three cases with slight improvement in two, but with no change in the third.

CONCLUSIONS

1. Menstruation does not necessarily occur in cases when a definite cyclic appearance of the female sex hormone can be demonstrated in the blood.

2. Menstruation may occur regularly, and even profusely, when the female sex hormone is absent or in insufficient quantity to be demonstrated in the blood.

3. If a strongly positive reaction preceding the menstrual period is accepted as the normal reaction, all but one of the cases complaining of sterility showed a definite variation from the normal, either in the strength of the reaction, its relation to the appearance of the menses, or by a negative reaction.

4. The female sex hormone in the blood is increased in amount during pregnancy.

5. Amenorrhea is, in itself, no evidence of sterility: the presence or absence of the female sex hormone in the blood may be the conclusive factor in a prognosis in such cases.

6. No definite conclusions can be drawn from so few cases; the general inferences, however, encourage further investigations along the lines indicated.

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121 EAST SIXTIETH STREET.

THE "RADICAL" IN OBSTETRICS*

BY JAMES W. DUNCAN, M.D., MONTREAL, QUEBEC

(From the Service of the Royal Victoria Maternity Hospital)

"THE estimate of a man's future usefulness to the State, may more often than not be measured by the manner of his birth."

Today one may divide the obstetric workers into three camps—the abolitionists, the moderates, and the conservatives. Of the three, which is the "radical"? How should one define the term? In our own translation the word extremist is a fair substitute. The enthusiast in each of these groups will point the finger of criticism at the other. Two of the groups must be at fault and being in error, constitute a grave danger.

Fetal death is a great catastrophe, but how much worse is later mental deficiency. Forceps and breech extraction are the two most frequent factors in the production of these two conditions; the pelvic canal, however, is a good third.

The doctrine of the abolitionist, of the whole or part of labor, more particularly the second stage, we know too well and may thus avoid recapitulating.

*Read at a meeting of the Brooklyn Gynecological Society, March 7, 1930.

Ultraconservatists wait for definite signals of maternal or fetal distress. The question arises: Do they frequently hesitate just a moment too long?

Recently we have been entertained by a published statement to the effect that the safest place for a woman to give birth to her baby is at home under the care of a midwife. One wonders if the writer of this ingenuous article realizes how free the midwife becomes after passing the responsibility on to the doctor or, as more frequently occurs, to the hospital.

Further discussion of this matter would almost be equivalent to time wastage.

The enforcement of fortitude and endurance by the conservatives leads to the inevitable overdilatation and, frequently, actual rupture of the pelvic floor. We who have passed through these stages of experience realize, in this attitude, the explanation of many of our still-born infants.

The "moderate" in obstetric practice might be defined as one who endeavors to obtain spontaneous labor, but combines with patience a reasonable estimate of the human capacity to work and assimilate punishment.

Fetal mortality upon this continent is stated to be at par with the highest in the world. From whence comes this scourge? Lack of education! Agreed. Perhaps it is utterly impossible to adequately reach the entire public. What of our future ambassador, the student?

Is obstetric teaching, upon the merit of its importance, in a proper position in the university curriculum? Do we, as teachers, condone or practice methods which in average hands are dangerous? To the end of time the majority of pregnant women will be under the guidance of average obstetricians.

The argument that a man may practice publicly what he dare not preach is incompatible.

The abolition of pain and fatigue will always create a great demand for service. The novice must emulate his competitor or starve.

One of these avenues is the safe road. Fetal mortality in this continent will only be reduced by honest self-investigation.

The Department of Obstetrics in McGill University professes a membership in the moderate school. Because of this we place before you the results obtained in 4,025 labor cases. May we impress upon you that these were all normal healthy women at term, about to begin or having just started in labor?

Table I gives the four blocks around which this résumé is written. The healthy or normal hospital group is virtually a report of last year's work in cases of anterior position. The healthy contracted pelvis group is a study of results in cases over the past five years. The posterior position series represents last year's experience with

this troublesome condition. The healthy group in private practice includes my own experiences of the past ten years.

TABLE I

| 1. Healthy Pregnant Woman Hospital Service | 2. Healthy Pregnant Woman Private Practice |
|--|---|
| 3. Healthy Woman with Contracted Pelvis | 4. Healthy Woman with Occipitoposterior Position |

TABLE II

| | HEALTHY WOMAN HOSPITAL SERVICE | CONTRACTED PELVIS HOSPITAL SERVICE | OCCIPITO- POSTERIOR HOSPITAL SERVICE | HEALTHY WOMAN PRIVATE PRACTICE |
|-------------------|---|---|---|---|
| Total No. Cases | 2349 | 381 | 102 | 1193 |
| Spontaneous Cases | 1729 | 217 | 37 | 783 |
| Artificial Cases | 620 | 164 | 65 | 414 |
| | 26.8% | 43% | 63.7% | 36.2% |

Table II exhibits how these 4,025 cases were divided among the groups, with the number and percentages of artificial terminations.

An explanation of our measure of contraction might well be offered at this point. A minor degree at the brim in the diagonal conjugate means 10.5 cm., at the transverse of the outlet 8 cm.; moderate at the brim, diagonal conjugate, 10 to 9 cm., at the outlet 7 cm. Maximum diagonal conjugate 8.5 cm., or less, the outlet 6.5 cm. or less.

Table III will indicate how many of these 344 contracted pelvises were found in minor, moderate, or maximum degrees.

TABLE III

| | FLAT AND FLAT RACHITIC | GENERALLY CONTRACTED | FUNNEL |
|--------------------|------------------------|----------------------|--------|
| Minor | | | |
| D.C. 10.5 cm. | 16 | 15 | 77 |
| Moderate | | | |
| D.C. 10 cm. 9 cm. | 136 | 43 | 28 |
| Minimum | | | |
| D.C. 8 cm. or less | 44 | 72 | 8 |

Some definition of terms used in the succeeding pages might be of value.

Elective.—An artificial termination of labor, without specific indication of maternal or fetal distress.

Prophylactic.—When a procedure is carried out to forestall a foreseen menace.

Fetal Distress.—Measured in all of these series by changes in rate, rhythm, and volume of the fetal heart. Maternal distress recognized only in pulse changes and the quality of uterine contractions.

Table IV presents a digest of the 2,766 spontaneous cases in so far as maternal and fetal mortality was concerned. The average baby weight was 3,230 gm., average hours in labor, 15.25.

In the vast majority of primiparae, in this series, a median or lateral episiotomy was performed at the moment of the crowning of the head.

TABLE IV. SPONTANEOUS LABOR

| | NO. CASES | SPONTANEOUS LABOR | MATERNAL MORTALITY | FETAL MORTALITY |
|--------------------------------------|-----------|----------------------|-----------------------|--------------------|
| Healthy hospital | 2349 | 1729 | 0.11% | 8 or 0.4% |
| Flat pelvis | 196 | 111 | 0 | 7 or 6.3% |
| Generally contracted | 72 | 56 | 0 | 1 or 1.7% |
| Funnel pelvis | 113 | 50 | 0 | 3 or 6.0% |
| Occipitoposterior | 102 | 37 | 0 | 1 or 2.7% |
| Healthy women in private practice | 1193 | 783 | 0 | 0 |

There are many of us who, twenty-five years ago, spent hours in purposely delaying the perineal stage of labor. The fond hope was conservation of tissue. We have long since graduated from such teaching into a wider knowledge. The better birth conditions of our babies, the marked decrease in postpartum hemorrhage because of reserve tone in the uterine muscle, emphasize this.

The gynecologist of former days thrived upon repairs of sacropubic hernia and prolapse. Today, from sheer necessity, he is driven into the obstetric ranks.

Of these four different types of women 2,766 or 68.4 per cent delivered themselves spontaneously, with a gross maternal mortality of less than 0.10 per cent. Strangely enough, the total maternal deaths occurred in multiparae after normal labor, two women dying of sepsis. The fetal mortality of 0.7 per cent is an extremely low one even in the confinements of healthy women. Two outstanding facts are proved, the large majority of women if left alone will, even in the face of possible dystocia, deliver themselves spontaneously of average-sized babies without great danger to themselves or to the children. We firmly believe that the performance of episiotomy, in the large majority of primiparae, may be given a great degree of credit for this low fetal wastage. To those who have never given this procedure a trial, I would recommend it to their investigation; to others who have been disappointed in their results, I would recommend a close study of their technic.

Except in two cases of prolapsed cord, all fetal deaths were due to the trauma of labor. Ten occurred in the contracted pelvis group. Possibly a more liberal view toward cesarean section might have saved them.

All fetal deaths occurred in prolonged first stage labors, more particularly in the flat pelvis.

Table V epitomizes the low forceps operation in the complete series. There will be noted a frequency of 13 per cent. The procedure in the

contracted pelvis group was totally of emergent character but productive of 50 per cent of the fetal loss in this study.

In the remaining vast majority 50 per cent were emergent; in other words emergent forceps accounted for the remaining 50 per cent of the net fetal death rate of 1.1 per cent.

There were 258 elective low forceps operations performed without one single infant loss.

It is well to note at this juncture that a child must leave the hospital alive and well to escape being counted a loss.

The average weight of these babies was 3,230 gm. The causes of death were: intracranial hemorrhage, two; intrauterine asphyxia, three; craniotomy after forceps failed in a funnel pelvis case, one.

In our clinic the use of elective low forceps after one hour's delay in the perineal part of the second stage of labor is almost universally the routine, and in primiparae is associated always with an episiotomy.

In my own private practice, as soon as internal rotation is complete, this procedure is carried out in every case at the present time.

TABLE V. LOW FORCEPS, HEALTHY HOSPITAL

| | NO. CASES | LOW FORCEPS | MATERNAL MORTALITY | FETAL MORTALITY |
|-----------------------|-----------|-------------|--------------------|-----------------|
| Normal hospital group | 2349 | 326 | — | 2 or 0.9% |
| Flat pelvis | 196 | 5 | — | 0 |
| Generally contracted | 72 | 3 | — | 1 or 33.3% |
| Funnel pelvis | 113 | 19 | — | 1 or 5.2% |
| Occipitoposterior | 102 | 17 | — | 1 or 5.8% |
| Healthy private | 1193 | 174 | — | 1 or 0.5% |

The study of the influence of the type of woman upon the weight of her baby revealed some interesting details. The average weight of 3,147 gm. occurred in the generally contracted pelvis, the masculine funnel group exhibited an average child of 3,875 gm. The worst offender of all was the posterior position, an average of 3,910 gm. The flat pelvis, on the other hand, developed the normal average of 3,213 gm.

TABLE VI. MIDFORCEPS

| | NO. CASES | MID-FORCEPS | MATERNAL MORTALITY | FETAL MORTALITY |
|------------------------|-----------|-------------|--------------------|-----------------|
| Healthy hospital group | 2349 | 157 | 0 | 9 or 4.9% |
| Flat pelvis | 196 | 9 | 0 | 4 or 44.4% |
| Generally contracted | 72 | 5 | 0 | 0 |
| Funnel pelvis | 113 | 11 | 0 | 2 or 18.1% |
| Occipitoposterior | 102 | 43 | 0 | 5 or 11.1% |
| Healthy private group | 1193 | 82 | 0 | 5 or 6.0% |

Table VI presents a résumé of a very vexed question: How may we avoid the use of midforceps? It is with regret that we have to report the performance of this operation upon 307 occasions or an incidence of 7.6 per cent. To our credit it may be said, none were elective.

Midforceps is only performed in our clinic by experienced members of the staff. The average weight of babies in this group was 3,200 gm. Fetal mortality, for this group, rose to the high figure of 8.1 per cent. Studying these fetal losses, the operation seems to have been desperately fatal in flat and funnel pelvis, also in the occipitoposterior positions. It must be noted that in these funnel pelvis deaths there was an associated posterior position at the commencement of labor.

The character of the labor in these three groups, without doubt, was one of the chief factors in the end-result. Attrition produced by punishment rendered the child unable to accept further compression and anesthesia. Midforceps as an emergent operation, with us, was a dismal failure. Prophylactic midforceps was performed 36 times with a fetal death in 3 cases, a percentage of failure in over 8 per cent of cases in which this procedure was given a trial. Our attitude toward the use of this method of delivery is to place it in our judgment as an operation of last resort. Every fetus was alive at the beginning of the operation. By far the greater majority of these infant deaths was due to intracranial hemorrhage, intrauterine asphyxia being a poor second. From our own experiences we unhesitatingly condemn the use of the procedure as a universal method for the abolition of the second stage of labor.

Table VII is an epitome of high forceps extraction, until just recently, only performed as an operation of last resort and usually entering the field of activity through the door of mistaken judgment.

TABLE VII. HIGH FORCEPS

| | NO. CASES | HIGH FORCEPS | MATERNAL MORTALITY | FETAL MORTALITY |
|------------------------|-----------|-----------------|-----------------------|--------------------|
| Healthy hospital group | 2349 | 15 | 0 | 6 or 40 % |
| Flat pelvis | 196 | 2 | 0 | 50 % |
| Generally contracted | 0 | 0 | 0 | 0 |
| Funnel pelvis | 113 | 2 | 0 | 1 or 50 % |
| Occipitoposterior | 102 | 5 | 0 | 2 or 40 % |
| Healthy private group | 1193 | 11 | 0 | 2 or 18.1% |

One glance at the terrifying fetal mortality rate would seem to justify such an opinion. Under all circumstances, but one, such an attitude is absolutely sound. In all but 18 cases in Table VII, the indication was both maternal and fetal distress and for all of them we accept your criticism. Ultraconservatism again comes to the front.

We have in the past few years changed our views with regard to the posterior position. The former slogan of leaving them alone has not been found satisfactory. In all but 18 of the 65 artificial cases we have been compelled to operate under the disadvantage of acute maternal and fetal distress. Last year there was an incidence of 102 such cases, primiparae 50, multiparae 52, including R.O.P. 67, L.O.P. 35. Of the L.O.P. cases 28 required a terminal operation, in R.O.P., 32 needed assistance. Spontaneous labor resulted in one fetal death, 2.7

per cent; artificial labor in eight or 12.3 per cent. In these deliveries all deaths were due to trauma.

For years we have recognized two types of posterior position, one starting labor with the membranes ruptured, in the other the membranes remaining intact until the cervix is fully dilated.

In dealing with these conditions we hope to escape the charge of encouraging the abolitionist. The situation is a very grave one, extremely costly in fetal wastage, no matter how dealt with, except by selective cesarean section. The price paid by the young bride in the cesarean section column is of course appreciated.

In the dry labor group we have waited until the lower uterine section has been thinned out completely, leaving only the paper-like edge of the os. With membranes intact, labor is allowed to proceed until the cervix and os are no longer factors. In the former, under deep anesthesia, the cervix is manually dilated or incised. In both, the head is pushed deliberately out of the pelvis, Pomeroy's maneuver performed, forceps applied, and the head brought down in the opposite anterior position with Barton, Kielland or other forceps according to the predilection of the operator. In using the Pomeroy maneuver we have been, upon occasion, embarrassed by prolapse of the cord. Dr. G. C. Melhado of this clinic has perfected a simpler and, in our experience, a much easier maneuver. The head is pushed out of the pelvis, and grasped with the palm of the hand over the posterior ear; it is then rotated to the transverse diameter of the pelvis; the posterior forceps blade is passed between the palm of the hand and the posterior ear; the anterior blade is simply rotated around the face to lock with its mate. Further rotation of the occiput to the anterior quadrant of the same side has proved an easy matter in all cases. The ease with which the head descends is really most amazing. In the 10 cases in which this simple technic was applied no grave maternal damage occurred and every child was born alive. We commend it to your investigation. In acting thus in anticipation of impaction we have delivered in all 18 women, 10 primiparae and 8 multiparae without fetal loss.

We point somewhat with pride to our breech results, shown in Table VIII; possibly we are not too heavily inflicted with them. The average weight of these babies was 3,393 gm. The insistence of non-interference in every case of breech until the body of the fetus up to

TABLE VIII. BREECH

| | NO. CASES | BREECH | MATERNAL MORTALITY | FETAL MORTALITY |
|------------------------|-----------|--------|--------------------|-----------------|
| Healthy hospital group | 2349 | 76 | 0 | 5 or 6.5% |
| Flat pelvis | — | — | — | — |
| Generally contracted | — | — | — | — |
| Occipitoposterior | — | — | — | — |
| Healthy private group | 1193 | 38 | — | 1 or 2.6% |

the level of the umbilicus was completely born, has been one of the main reasons for a gross mortality in a total of 114 births of but 5.2 per cent, as compared with a general average of over 10 per cent. Lately we have begun the application of forceps upon the aftercoming head as recommended by Piper of Philadelphia, and from our experience of this technic so far we expect to make a further reduction in our losses.

Every fetal death in this series was due either to cerebral damage or a broken neck. It may be fitting here to speak of a teaching fault, namely, the old direction to wait only so many minutes after the umbilicus appears, the vigor, resultant of this time limit to my mind, has produced more fatalities of the newborn than any other step in the technic. Personally we overemphasize the necessity of taking all the time needed; personally I have found it very hard indeed to use up five minutes.

The assurance of making the anterior arm come down in front of the head by Potter's maneuver with pressure downward and backward upon the inferior angle of the scapula has helped a great deal indeed.

Version and extraction in the Royal Victoria Maternity Hospital is almost totally an operation of emergency. The very fact that in a series of 4,205 (Table IX) confinements, version and extraction have been performed only upon 42 occasions, and of these but 5 were elective, indicates clearly the affection and faith in which we hold it. Fetal mortality in elective cases was 20 per cent, in the emergent, 37.8 per cent. The indications in the emergent class were uniformly positive, face and transverse presentation, prolapsed member, prolapsed cord.

TABLE IX. VERSION AND EXTRACTION

| | NO. CASES | VERSION AND EXTRACTION | MATERNAL MORTALITY | FETAL MORTALITY |
|----------------------|-----------|------------------------|--------------------|-----------------|
| Healthy hospital | 2349 | 16 | 0 | 8 or 50 % |
| Flat pelvis | 196 | 7 | 0 | 6 or 87 % |
| Generally contracted | 0 | 0 | 0 | — |
| Funnel pelvis | 113 | 2 | 0 | 0 |
| Occipitoposterior | 0 | 0 | 0 | 0 |
| Healthy private | 1193 | 17 | 0 | 1 or 5.8% |

The desperate chances of the baby in the flat pelvis group is most vividly shown. In these cases the condition of the fetus at the commencement of operations was in all cases better than fair. One hears the justifiable criticism, "Not doing this often enough, small wonder you fail." We heartily agree. Is it not then a very just reason for a generous condemnation of this modern attempt to popularize a procedure which, even in an institution especially equipped and under the care of fairly well trained and experienced obstetricians, is so eminently destructive?

Always if possible in our clinic an elective operation, performed in this series, 141 times, of which 4 were emergent cases (Table X). The gross fetal mortality among these 141 babies was 2.8 per cent. Three died before leaving the hospital, one from hemorrhagic disease, a second from inanition, the third from congenital occlusion of both ureters. Two died within forty-eight hours of delivery, both from the trauma of labor, which was well advanced before admission to the hospital.

TABLE X. CESAREAN SECTION

| | NO. CASES | CESAREAN SECTION | MATERNAL MORTALITY | FETAL MORTALITY |
|----------------------|-----------|------------------|--------------------|-----------------|
| Healthy hospital | 2349 | 27 | 0 | 2 or 14 % |
| Flat pelvis | 196 | 41 | 0 | 1 or 2.5% |
| Generally contracted | 72 | 4 | 0 | 0 |
| Funnel pelvis | 113 | 18 | 0 | 1 or 5.5% |
| Healthy private | 1193 | 88 | 0 | 0 |
| Occipitoposterior | 102 | 0 | — | — |

The low cervical, extraperitoneal and classical operations are used; the majority of patients, however, were operated upon by the classical technic.

We freely admit an ultraconservatism in our attitude toward this surgical procedure. The indications in our clinic must be almost positive, especially in the contracted pelvis group, and the majority of our cesarean operations was performed in this class. In a young woman under thirty, unless the disproportion was definite, or a history of previous attempt with failure was obtained, the patient was subjected to the definite trial of labor. Labor once thoroughly established, we considered the door to section closed. Many of our mid- and high forceps operations and three of our craniotomies were the reward for this stand. Mistakes of bad judgment, yes, but in good conscience.

The safety of the extraperitoneal operation has never deeply impressed us.

TABLE XI. DESTRUCTIVE OPERATIONS

| | NO. CASES | DESTRUCTIVE OPERATION | MATERNAL MORTALITY | FETAL MORTALITY |
|-----------------------------|-----------|-----------------------|--------------------|-----------------|
| Healthy hospital | 2349 | 1 | 0 | 1 or .05% |
| Flat pelvis | 196 | 4 | 0 | 4 or 2.04% |
| Generally contracted pelvis | 72 | 0 | 0 | 0 |
| Funnel pelvis | 113 | 1 | 0 | 1 or .8% |
| Healthy private | 0 | 0 | 0 | 0 |
| Occipitoposterior | 0 | 0 | 0 | 0 |

The one evidence I can offer in rebuttal in these 141 cesarean sections is the consistent zero mark in the column for maternal mortality. In fact, may we draw your attention to the maternal mortality column, in all procedures developing in the care of these 4,025 women, to the almost negative death rate.

Table XI is a study of these regrettable end-results and will expose the guilt of the flat pelvis. Three of these patients were brought to the hospital in such condition that other procedures were impossible. Two of the babies were already dead. The almost universal escape of the generally contracted pelvis from the complication of labor or as a great factor in fetal mortality is interesting and instructive.

Table XII demonstrates the frequency of the different types of labor in percentages. Opposed is a corresponding estimate of how much fetal loss each added to make up the whole. The three great offenders stand out all too prominently, mid- and high forceps, version and extraction, the greatest criminal of the three being version and extraction.

TABLE XII. GROSS FETAL MORTALITY 2.3 PER CENT IN 4205 CASES.

| | SPONTANEOUS DELIVERY USE | LOW FORCEPS USE | MIDFORCEPS USE | HIGH FORCEPS USE | BREECH DE- LIVERY USE | VERSION AND EXTRACTION USE | CESAREAN SECTION USE | DESTRUCTIVE OPERATION USE |
|--------------------|-----------------------------|--------------------|--------------------|---------------------|--------------------------|-------------------------------|-------------------------|------------------------------|
| Frequency | PER CENT 68.4 | PER CENT 16 | PER CENT 7.6 | PER CENT 0.84 | PER CENT 2.8 | PER CENT 1.4 | PER CENT 0.34 | PER CENT 0.14 |
| Fetal mortality | 0.47 | 0.14 | 0.62 | 0.29 | 0.14 | 0.3 | 0.9 | 0.14 |
| Maternal mortality | 0.4 | - | - | - | - | - | - | - |

TABLE XIII. CAUSES OF FETAL DEATH

| | | |
|-------------------------|----|----------------|
| Intracranial hemorrhage | 37 | } 55-----59.1% |
| Intrauterine asphyxia | 12 | |
| Craniotomy | 6 | |
| Other | 38 | -----40.9% |

Table XIII is a diagram of the causes of fetal death. A glance is all that is necessary to make us realize the futility of interference as a means for conservation.

CONCLUSIONS

1. Episiotomy is one of the best procedures of a moderate school.
2. Elective low forceps is a very close second.
3. The pelvic floor and perineum are in the vast majority of cases conserved by the combination of these two.
4. Emergent or prophylactic low forceps is the best way out of a bad hole.
5. Breech extraction, under modern improved technic, need not become the cause of so much fetal loss as in the past.
6. The occipitoposterior position still demands our deepest respect, but does not compel the same old fear.

7. Cesarean section is not 100 per cent safe for the child, because, of the intrauterine fetus we really know nothing.

8. It is not consistent with good judgment to interfere with the normal healthy woman, unembarrassed by complication of pelvis or position, who, if left to herself, will in 71 per cent of cases deliver herself without maternal or infantile injury.

9. Conversely, it savors almost of the insane to introduce, as agents for the relief of pain, fatigue and a much exaggerated amount of tissue damage, operative procedures responsible for 80 per cent of the fetal mortality exhibited here.

10. The "radical" of obstetrics, in our humble opinion, is to be found at either end of the chain, in the conservative and abolitionist camp.

11. For the former we believe there is hope. Surgery seems to be the only treatment for the latter.

In the opening of my address to you I used a quotation from Professor W. W. Chipman; in closing may I use another of his, "If it is important to be in the world at all, and most of us act as if it were, the manner and safety of our entrance are surely a first consideration."

We would like to express our gratitude to Dr. Leon McGoogan of Green Falls, Mass., for the use of the figures derived from his splendid study of our contracted pelvis cases.

MEDICAL ARTS BUILDING.

Terrades: A Case of Ovarian Tumor Recurring After 16 Years. *Rev. espan. de obst. y gynec.* 15: 121, 1929.

The patient, forty-six years old, single, had a tumor of the right ovary, weighing 7 kg. removed in 1912. The tumor is described as having been epithelial and composed of cystic cavities. Before operation she had amenorrhea, change of voice, and hypertrichosis for three years, all of which disappeared after it.

Sixteen years later (1928) she was again admitted with a large fluctuating abdominal mass, some ascites, and amenorrhea for ten months. At operation the same kind of tumor, weighing 6 kg., attached to the omentum by large vessels and also to the intestines, was found. The pedicle was attached to the abdominal wall, 4 cm. below the umbilicus. There was no connection between tumor and pelvic organs. The postoperative course was normal and the patient immediately regained her menstruation.

The author believes that the recurrence was due to implantation following the first operation, resulting in a slow growing tumor which attached itself to the omentum, and received its nutrition from it. The amenorrhea was due to an inhibition and neutralization of the ovarian hormone by the secretion elaborated by the tumor cells.

FRANK SPIELMAN.

THE SURGICAL PATHOLOGY OF THE FIBRINOPLASTIC OR ADHESIVE VARIETY OF TUBERCULOUS PERITONITIS

BY J. W. KENNEDY, M.D., PHILADELPHIA, PA.

UPON several occasions within the recent past I have heard prominent teachers tell medical students that the adhesive variety of tuberculous peritonitis was unsurgical and that good surgical results could be expected only with the miliary and ascitic varieties of tuberculous peritonitis.

This, I feel, is a very grave mistake and should not be transmitted to our student body as surgical teaching.

The opinion that the patient with an adhesive variety of tuberculous peritonitis is doomed to a short life is a statement which I have seen refuted a great number of times.

The immediate urge of the writing of this paper is an interview this morning with a patient who was operated upon for the fibrinoplastic variety of tuberculous peritonitis in the Joseph Price Hospital over a quarter of a century ago. This patient was in a perfect state of health, showing no evidence of tuberculous trouble, although she had been operated upon for the adhesive variety of tuberculous peritonitis in which the entire intestinal canal was found in a conglomerate mass resembling a solid tumor.

We have found a large number of patients living from five to thirty years who underwent a similar operation for the same tuberculous condition.

It is with a feeling of regret and apprehension that I view this teaching, namely, that the condition of fibrinoplastic variety of tuberculous peritonitis is unsurgical. On the contrary I know of no condition in the abdominal cavity where thorough surgery is more rewarded.

Many times I have seen a mere skeleton of a patient return to full weight, resume her former occupation and also excel in athletic sports and exhibit feats of strength and endurance.

Certainly in 95 per cent of the patients who have come to the Joseph Price Hospital during my thirty years' association with the institution, we have been able to separate all of the adhesions existing between the coils of the intestine and adjacent viscera, and nothing short of this thorough surgery will be rewarded by a great percentage of successes. The tuberculous peritoneum will stand surgical manipulation with less degree of surgical shock than the normal peritoneum and so will any peritonitic peritoneum. This principle we have discussed a number of times elsewhere.

We do not consider any incipient or chronic tuberculous lesion of the lungs or kidney a contraindication to thorough surgery for tuberculous peritonitis; we are concerned with the question of tuberculous dosage.

I have seen incipient tuberculous lesions of the lungs clear up following thorough surgery for the adhesive variety of tuberculous peritonitis; just as we have seen an incipient tuberculous lesion of the kidney remain symptomless after removal of the other kidney for an advanced tuberculous lesion.

We have also seen this principle exemplified in the removal of large malignant ovarian cysts which were the parents of numerous infant daughter cysts which were scattered throughout the abdominal cavity, the numerous small cysts disappearing after removal of the extensive parent growth and the return of the health and resisting powers of the patient.

In operating on the patient with the adhesive variety of tuberculous peritonitis we proceed as follows: If there is any portion of the bowel free from adhesions or any line of cleavage leading into the tuberculous mass, we start at this point and break all adhesions between the coils of intestines, exposing both sides of the mesentery, which simply means that the ultimate adhesions must be broken. The adhesions must be broken by expression or pressure by the thumb and fingers, the force being used at the expense of the adhesions and not the bowel wall—this is most important.

All tuberculous structures which permit amputation should be removed, such as the appendix, tubes and ovaries and as much of the involved omentum as possible, in order to assist in reducing the dose of the tuberculous lesion.

In my opinion the tuberculous infection is continued from the absorption that takes place between the adherent surfaces, and it is here that later necrosis and caseous degeneration take place. Furthermore, the breaking of all adhesions helps to release partial chronic bowel obstructions, the stasis of which must cause a harmful degree of infection from the mucous membrane of the enteron and thus help lower the natural resistance of the patient.

During the operation as the adhesions are broken and surfaces exposed, they are dusted thoroughly with iodoform. It is astonishing the amount of iodoform these patients can stand. Evidently the power of absorption of the tuberculous peritoneum is reduced to a minimum, yet these patients will have a metallic odor to their breath for several days after operation apparently with no harmful result.

The advantages of the radical surgery by which all adherent tuberculous surfaces are separated, are clearly indicated by those patients who had undergone an abdominal operation which consisted of merely opening the abdomen and was abandoned when the adhesive variety

of tuberculous peritonitis was discovered. When these same patients later were operated upon in the Joseph Price Hospital by the method indicated in this paper, brilliant results were obtained.

We do not drain these patients. Every possible care should be taken to prevent a postoperative fistula. Tuberculous fistulas are not prone to close spontaneously.

I have often been asked about the effect of the iodoform. I am not sure whether the beneficial effect is due to its bactericidal power or whether the irritation from the iodoform causes a helpful hyperemia.

The very radical surgery which is incident to breaking all the adhesions and exposing all possible tuberculous surfaces, certainly causes a marked operative hyperemia, and this may be one of the most important factors in recovery.

It is my opinion that the iodoform does help to prevent return of the adhesions and may do so by retarding early bacterial invasion.

Dr. Price called attention to two patients upon whom he had operated several years before for the adhesive variety of tuberculous peritonitis; he did not have sufficient iodoform at the time of the first operation to cover the peritoneal surfaces after separating the adhesions. He operated on these same patients later and found those areas that he had not dusted with iodoform firmly adherent, whereas the other surfaces which had been properly treated with iodoform were quite free from adhesions.

If the tuberculous patient comes to surgery at that late stage which may be called caseous, which means degeneration has already taken place, this will probably prevent the radical surgery which I have already indicated, as the visceral structures will be necrosed and will not stand manipulation.

I have seen the omentum nearly two inches thick and so very brittle that it would break upon manipulation, and yet even these late cases must be given a chance.

I feel that the surgical pathology of peritonitis in general will have to be rewritten. The "sacred" adhesion must not prevail.

Better surgery must be taught and done in the peritonitic abdomen, and the patient with the adhesive variety of tuberculous peritonitis should be placed on the surgical list and will often give the most brilliant results when in an apparently hopeless condition.

VESICOABDOMINAL FISTULA AS A COMPLICATION OF LABOR

By HONORIA ACOSTA-SISON, M.D., MANILA, P. I.

(From the Departments of Obstetrics and Gynecology, University of the Philippines)

FISTULA involving the bladder wall in cases of prolonged obstructed labor is not unusual. It is one of the complications to be feared by the obstetrician after a difficult forceps extraction or after a prolonged impaction of the head within the pelvic cavity. Vesicoabdominal fistula (or one which communicates the bladder with the abdominal wall or peritoneal cavity) as a complication of labor, however, is one that has not been described in the obstetric and gynecologic textbooks, monographs or journals to which I have access. As far back as 1885, only a few cases of vesicoabdominal fistula have been reported, but they occurred as complications of abdominal operations (Whiteside), abscess (Buckingham), vesical tumors (Whiteside), or accidents from x-ray burn (Ottow). There was one vesicointestinal case (Marcey) that resulted after an unusually strenuous exercise.

In the Philippine General Hospital from the date of its establishment in 1910 to December, 1929, there have been 41 cases of vesical fistula, 37 of which were vesicovaginal, as follows:

| | |
|--|----|
| After prolonged labor ending in forceps delivery | 14 |
| “ “ “ “ podalic version | 6 |
| “ “ “ “ embryotomy | 1 |
| “ “ “ “ spontaneous delivery | 11 |
| “ stone removal per vaginam | 2 |
| Cause not stated in history | 3 |

In one of these three cases, the fistula was vesicovaginorectal. Five cases, four male and one female, were diagnosed as vesicoabdominal fistulas and were all complications of abdominal operations, two of them being for suprapubic removal of stone from the bladder. As in all of them the urine made its exit through the abdominal wound, diagnosis was easy.

The barrenness of medical literature concerning vesicoabdominal fistula as a labor complication and the importance of its recognition, especially when the urine is retained within the abdominal cavity, prompted the author to report the following two cases:

CASE 1.—S. P., primipara, twenty-one years of age, was admitted to the obstetric ward on July 30, 1929, with the complaint of labor pains. On admission she was anemic and asthenic. For a month before admission, she had been having an irregular low fever and frequent micturition. The bag had ruptured prematurely

and the head which was in R. O. P. position was impacted on the perineum with no progress in spite of two hours of strong expulsive pains. A low forceps application was made and a live small baby weighing 2200 gm. was extracted by Dr. Barican. In the afternoon and evening after the operation, she complained of much abdominal pain and inability to urinate. She was catheterized but only 5 c.c. of urine were obtained. On the second day, she vomited ascaris twice and complained of epigastric pain, hunger, and anorexia. On the third day, she moaned on account of epigastric pain and painful defecation. On the fourth day, she vomited yellowish material, and on the sixth day, a pear-shaped cystic tumefaction in the bladder region was noticed. Vaginal examination showed bulging of the anterior fornix and the cervix uteri was high. Catheterization obtained only 200 c.c. of bloody urine. Ever since the delivery the patient had a low septic temperature ranging from 37° to 38.5° C. The pulse, however, was rapid, from 120 to 140. The uranalysis made on August 18, or tenth day of puerperium, was as follows:

Pale, thick and foul; albumin heavy; abundant erythrocytes and pus cells; many finely granular casts and a few squamous and epithelial cells. Stool examination

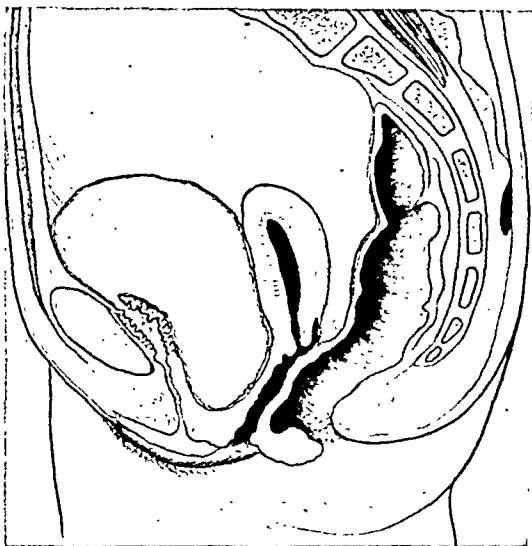


Fig. 1.—Diagrammatic view of the false urinary sac in Case 1. It is connected with the shrunken bladder by an opening at the upper portion.

showed abundant ascaris eggs. Blood culture negative. Leucocyte count gave 19,000; neutrophiles, 70; small lymphocytes, 20; large lymphocytes, 4; large mononuclears, 3; eosinophiles, 3.

The bladder was irrigated daily with borax solution and grayish necrotic particles came out with the irrigating fluid. Apparently all the solution introduced, which was not more than 20 c.c. at each instillation, was always recovered. The cystic painless pear-shaped tumefaction over the bladder region kept increasing slowly in size. Throughout, she urinated spontaneously but in small amounts. She progressively became weaker and died on the twenty-eighth day of the puerperium. On autopsy the pathologist, Dr. Barrera gave the following report: Chronic localized peritonitis, gangrenous cystitis with perforation of the anterior wall and formation of a large inflammatory sac of pus and debris, chronic purulent endometritis and endocervicitis, and parenchymatous degeneration of all visceral organs. Occupying the normal place of the bladder was a purulent necrotic sac bounded anteriorly and laterally by the abdominal wall and superiorly by a thick layer of fibrinous exudate which matted together the loops of the small intestine. The sac was

connected below by an opening the size of a finger tip on the anterior wall of the bladder which had shrunken to a small cavity the size of a chicken's egg toward its fundus. (Fig. 1.)

CASE 2.—B. A., twenty-three years of age, primipara was admitted to the Hospital on October 7, 1929, with the complaint of prolonged strong labor pains and impaction of the fetal head in the pelvic cavity for twelve hours before admission. The lower extremities were markedly edematous for three weeks before admission. The external genitalia also became edematous after the onset of labor. Patient was prepared for forceps delivery under chloroform anesthesia but she delivered spontaneously a stillborn full-term fetus before the instrument could be introduced. There was no perineal laceration but the vagina was widely gaping. Six hours after delivery, patient had two convulsive attacks followed by unconsciousness. She became conscious a few hours after the second convulsion but throughout the puerperium she was weak and dull. The temperature since the first day was irregular and septic in character ranging from 37.5° to 40.5° C. The bladder was atonic so that it had to be emptied by catheterization and at times as much as 1 to $1\frac{1}{2}$ liters of urine were obtained. The uranalysis made on the twelfth day when she died showed a thick turbid urine with heavy albumin, granular casts, and abundant erythrocytes and pus cells. The leucocyte count was 27,800; polymorphonuclear 96 per cent; small lymphocytes 4 per cent. The autopsy findings by the aforementioned pathologist were: Acute serofibrinous peritonitis, gangrenous cystitis with incomplete perforation of the bladder on the anterior wall, pyelonephritis, acute endometritis, congestion of the brain and parenchymatous degeneration of all the organs. The bladder was filled with thick opaque urine. The mucosa specially at the posteroinferior part was thickened and markedly gangrenous. At the upper part of the anterior wall or at the apex was a small necrotic area the center of which was perforated as far as, but not through the serosa. The serous covering was however so thin and weakened that on stretching the bladder it was easily torn through. Much serofibrinous exudate was found in the neighborhood of this perforation.

DISCUSSION

The interest in these cases is the apparently unusual location of the perforation on the anterior wall of the bladder near the apex which the author believes to be *locus minoris resistentiae* on account of its nearness to the symphysis. The location is such that an incomplete perforation, as in Case 2, must often escape notice unless cystoscopy is made. Perhaps if carefully searched for, it will be found more frequently in those cases of labor where the head remained impacted within the pelvic cavity for a long period, followed by urinary disturbances during puerperium and supposed to have died of pelvic inflammation. Both of the patients were primiparas. Primiparas would seem to be specially predisposed on account of the tendency of the head to engage during the last months of pregnancy, pressing on the bladder, and favoring a cystitis which weakens the resistance of the bladder wall, especially in patients who are anemic and asthenic as in Case 1. The patient in Case 2 was also weak on account of nephritic toxemia. Both had prolonged impaction of the fetal head within the pelvic cavity. The one that had impaction of longer duration delivered

spontaneously a stillborn child, while the other that was relieved by a low forceps extraction had a live child. In both the cause of the perforation was undoubtedly the prolonged pressure on the bladder wall which was sandwiched between the hard symphysis and the fetal head.

That pressure necrosis alone and not forceps application was the cause in Case 1 was shown by the absence of injury on the vaginal wall, or of a vesicovaginal fistula which would have resulted if the instrument was the causative agent. The perforation was larger than in Case 1, the urine passed through the bladder wall and had dissected its way between the peritoneum and lower abdominal wall, and a thick inflammatory sac had formed in front of the uterus where the bladder should be. That pressure necrosis was also the true cause in Case 2 was shown by the fact that the gangrenous changes were most marked at the lower posterior wall on account of the stagnation of the urine in that locality, the perforation took place at the upper part of the anterior wall nearest the symphysis pubis. The perforation was not complete and it developed slowly. The serous coat of the bladder was apparently intact enough to keep the urine within the bladder. From the autopsy findings, however, it could be seen that it was only a question of time before the serous wall would have given way.

As to the possibility of diagnosing the condition: Since the perforation in Case 2 was incomplete and the urine had not leaked beyond the bladder wall, the perforation could not have been suspected *in vivo*. The failure of diagnosing the true condition early in Case 1 was due to the fact that the pear-shaped enlargement was at first mistaken for the subinvolved infected uterus. The pelvic pains were attributed to uterine infection and the epigastric pains and vomiting which must have been caused by the local peritonitis, were assumed to be due to the ascariasis. The bloody urine was attributed to acute cystitis. The fact that the patient urinated spontaneously and that fluid introduced into the bladder was recovered made us doubtful as to the presence of a vesicoabdominal fistula which was supposed to be necessarily accompanied by extravasation of urine into the peritoneal cavity. However, the cystic character of the enlargement, its increase in size coincident with scanty micturition, the abnormally high location of the cervix, and the cystic bulging of the anterior fornix not diminished by catheterization were unmistakable signs of encapsulated urine outside the bladder. The only condition it could simulate would be an ovarian cyst or an ectopic pregnancy. But the history of the development of the enlargement, the absence of scanty micturition and the characteristic finding of an exploratory puncture of the tumor would eliminate the former. Cystoscopy would probably establish the diagnosis.

TREATMENT

The prophylactic treatment would be to watch the progress of the presenting part carefully during the second stage specially in those cases with premature rupture of the bag. If in the presence of strong expulsive pains recurring at frequent intervals no progress is observed in one or two hours, it is a conservative measure to extract the child according to the method suited for each case always with due consideration for the integrity of the maternal soft parts. The bladder should be emptied before each operation. The manner of passing urine, its character and amount should be carefully noted in the first days of puerperium to eliminate the possibility of vesical fistula. This is especially true in operative labors. And in cases of bladder paresis where all the means of inducing spontaneous micturition fail, aseptic catheterization at regular intervals should be made. In these cases, the bladder should not be allowed to retain more than 300 or 400 c.c. of urine at any one time.

As for the curative treatment, in a small fistula like the one observed in Case 2 a retention catheter and a judicious irrigation of the bladder with small quantities of mild aseptic solution may inaugurate spontaneous healing. But when the urine has passed beyond the limit of the bladder wall, the obvious treatment would be abdominal drainage of the urinary sac, the use of the retention catheter and repair of the perforation as soon as the tissues normalize.

SUMMARY

1. Injury to the bladder wall which may result into a vesicoabdominal fistula is a complication that must be guarded against in all cases of prolonged dry labor with impaction of head in the pelvic cavity and accompanied by strong ineffectual expulsive pains.

2. Vesicoabdominal fistula is not necessarily accompanied by extravasation of urine into the abdominal cavity for the peritoneal covering may resist, in which case the urine dissects its way beneath the loose subperitoneal tissue and becomes encapsulated.

3. Scanty urination, especially if bloody, and the presence of a recent, rapidly increasing cystic enlargement corresponding to the bladder region which persists after catheterization, and the high location of the cervix, are characteristic signs of a vesicoabdominal fistula with encapsulated urine. Cystoscopy may definitely establish the diagnosis. Ovarian cyst and ectopic pregnancy are conditions which may remotely simulate it.

4. Timely and appropriate intervention in cases where labor test has failed and prompt attention given to cystitis during pregnancy are measures to be observed. The rational curative treatment should be abdominal drainage of the urinary sac, the introduction of a urethral retention catheter and the repair of the perforation via the abdominal route.

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1002 TAFT AVENUE.

WALTER CHANNING AND ETHERIZATION IN CHILDBIRTH

BY HERBERT THOMS, M.D., NEW HAVEN, CONN.

THE introduction of anesthesia and anesthetic methods into obstetrics in civilized countries was accomplished only after opposition which was characterized by unintelligence, bigotry, and religious intolerance. In our own country even today, one still sees occasional evidence on the part of the laity of opposition to the use of such benignant therapy, the dying echoes of a once raging conflict.

Associated with the early days of this long and important struggle appear two men whose names will not be forgotten by those who share the benefits of their endeavor. These are Sir James Y. Simpson of Edinburgh and Walter Channing of Boston. The story of the former is well known, and has been many times recorded, while that of our own countryman may be somewhat unfamiliar to the readers of this publication.

Walter Channing interests us not alone because of his important rôle in the introduction of anesthesia in obstetrics but also because he was one of America's eminent obstetric teachers, and among other achievements was the first to describe a clinical entity which will alone immortalize his name as long as anemic states of the blood are studied.

Walter Channing was born in Newport, Rhode Island, April 15, 1786. His father, an attorney, was at one time Attorney General of the State, and his mother was Lucy Ellery, daughter of William Ellery, a "Signer" of the famous Declaration. He was one of three brothers, all of whom had illustrious careers. The fame of his elder brother, the Rev. William Ellery Channing, is too widespread to need more than mention, while his younger brother, Edward T. Channing, was remembered by many generations of Cambridge students as the Professor of Rhetoric from 1819 to 1851 in Harvard University. Walter and Edward Channing entered Harvard together in 1804, in the class with their cousin, Richard H. Dana, the poet. Because of participation in his junior year in the well-known students' rebellion, Walter Channing left college, and thus failed to secure his bachelor's degree in regular course, although it was bestowed upon him later. He immediately entered into the study of medicine, and pursued his studies in Boston, Philadelphia, Edinburgh, and London. In 1809 he received his M.D. from the University of Pennsylvania, and Harvard conferred upon him

the same degree ad eundem in 1812, shortly after his return from his studies in Europe. In May, 1815, he was elected Lecturer in Midwifery, entering the medical faculty with Jacob Bigelow and John C. Warren, the latter succeeding his father as Professor of Anatomy and Surgery. Three years later Channing was given a full professorship in Obstetrics and Medical Jurisprudence, a position which he held until 1854.

At the first regular organization of a medical faculty connected with Harvard which took place in Boston November 1, 1816, Channing, who had been secretary of the professors of the school, was elected dean,



DR. WALTER CHANNING

Portrait by Ames

(Courtesy of Mr. Walter Channing, Boston, Mass.)

the office having been created at that meeting. On October 6, 1818, we find a vote recorded by the corporation that "the lecturers in Materia Medica and Botany, and Midwifery be denominated Professor in their respective departments, having rights and duties according to the Statutes of the Medical Institution of the University, but without any claim to compensation other than the fees they may receive from their pupils." A circular in 1823 states, "Midwifery and Medical Jurisprudence, Dr. Channing Fee \$10," and as early as 1827 a course of lectures in Midwifery was advertised by Walter Channing, to be given in the summer months.

In his private practice he was chiefly interested in obstetrics, and he was one of the first attending physicians at the Boston Lying-In Hospital. He was also for many years on the visiting staff of the Massachusetts General Hospital. He was one time librarian of the Massachusetts Medical Society, and an Honorary Fellow of the Obstetrical Society of London.

Shortly after ether was introduced at the Massachusetts General Hospital, Walter Channing became interested in its application to childbirth, and it was through his influence more than any other that its use became known in this country.

It is difficult for us in this day to realize the great opposition that came into being largely as a result of the efforts of Simpson and Channing to introduce anesthesia in childbirth. Not only the laity and the clergy but many members of the medical profession were unyielding in their attitude toward this innovation. These medical opponents were the most powerful in their denunciation. In the process of parturition they maintained that pain was "a desirable, salutary, and conservative manifestation of life force." The religious objections urged by the clergy were based chiefly upon the primeval curse upon womanhood found in Genesis 3:16, which reads in part, "Unto the woman he said . . . in sorrow thou shalt bring forth children."

Channing's important contribution was entitled, *A Treatise on Etherization in Childbirth*, and was published in Boston in 1848. It was dedicated to James Jackson, Professor Emeritus of Theory and Practice of Physics at Harvard. In the beginning of the volume the author says, "Occupying a somewhat public position as a teacher of Midwifery, a department of Medicine which has derived special and vast benefit from the discovery referred to, it seemed not out of place for me to collect and present to the profession, the results of its application, among ourselves and elsewhere, to that branch of the medical art." In speaking of the plan and object of the work, Channing tells us of the condition existing at the time of its publication. "Etherization was in use here, and in different parts of the country, in midwifery practice. We were hearing of results through journals and newspapers. They existed alone. The thought occurred to me that, with very little personal trouble, I might collect from various sources, facts in regard to etherization which would, in a much surer manner, make my work useful, than would anything of my own which it might contain."

Another item of historical interest has come down to us in a letter written to Sir James Simpson by Professor Charles D. Meigs, who was professor of Obstetrics at Jefferson Medical College. Perhaps it might be expected that the man who opposed so strongly Oliver Wendell Holmes's contention of the contagiousness of puerperal fever would

also be reactionary with regard to anesthesia in midwifery. However, it is undoubtedly true that Meigs voiced not only his own but the opinion of many obstetric leaders of his day when he answered Simpson's query as to the status of anesthesia in midwifery in America. In characteristic style Meigs replied, "As to its employment here (in Philadelphia) . . . I think it has not yet begun to find favor with accoucheurs. I have not exhibited it in any case; nor do I at present know of any intention in that way entertained by the leading practitioners of obstetric medicine and surgery, in this city. . . . But should I exhibit the remedy for pain to a thousand patients in labor, merely to prevent physiologic pain, and for no other motive, and if I should in consequence destroy only one of them I should feel disposed to clothe me in sackcloth and cast ashes on my head for the remainder of my days. What sufficient motive have I to risk the life or death of one in a thousand, in a *questionable attempt to abrogate one of the general conditions of man?*" What a difference in viewpoint is that of Channing, who says of his book, "It treats of a noble subject—the remedy of pain."

Before the publication of his treatise, Channing had circularized many physicians so that he was able to present in addition to his argument the results of anesthesia in 581 cases of childbirth. With this material he presented adequate proof of its beneficence and safety. The religious objections, however, were not to be met with clinical data. The same opposition that Simpson faced abroad was equally determined in America. Channing's essential argument in meeting these opponents was that the application of agents of nature to the relief of pain was also the use of God-given means by God-given powers. The situation was not wholly devoid of humor, and in discussing this phase of his subject Channing could not resist the following: "The interest in our subject," he writes, "has extended beyond the medical profession, and has even reached the pulpit. A sermon was preached here a few weeks since, on the introduction of etherization, and excited some interest. The text was, 'Deliver us from Evil.' Said one to a friend, as he left the church, 'How did you like our sermon?' 'Very well,' was the reply. 'It is not wholly wrong to lessen or destroy pain. We may eat peppermints!'"

It is interesting to note that Channing's old teacher, Benjamin Rush, had believed that "pain does not accompany childbearing as an immutable decree of Heaven," and again, "I have expressed hope . . . that a medicine would be discovered that should suspend sensibility altogether, and leave irritability or the powers of motion, unimpaired, and thereby destroy labor pains altogether." And so Channing's book stands out today not only as a scientific accomplishment but as an historical document. One cannot scan its pages without feeling the

honesty and earnestness of purpose of the author. Sir James Simpson found a worthy compatriot in Walter Channing who more than anyone else won the fight of anesthesia for America.

It is interesting for obstetricians to know that Channing is great not only as a champion of anesthesia but also because of his reputation as a teacher of Obstetrics at Harvard. He was an author of considerable note. He wrote a volume of poems, and his *Physician's Vacation*, published in 1856, gives us not only a fine record of European travel but a splendid portrayal of Sir James Simpson, at whose home Channing stayed while in Edinburgh. Among his medical publications perhaps the greatest interest is found in his *Notes on Anhaemia principally in its connection with the Puerperal State, and with Functional Disease of the Uterus; with cases*, published in 1842. This is the first recorded description of so-called hemolytic anemia of pregnancy. There is one paragraph from this excellent contribution which gives remarkable insight into the extraordinary mind of its author. In speaking of the treatment of the condition he writes with almost prophetic vision, "The question of Transfusion has often occurred to me. But of what possible benefit would be such a supply of blood? What might not the effect be of filling almost empty vessels with a fluid so unlike that which already circulates in them, and which their own functions have produced? In a disease so fatal, some risk might be incurred. But is Transfusion an operation which our present knowledge of it would authorize? If safe in itself, however, *might not time be gained by the operation, for such functional changes to occur as would supply healthful blood?*" (Italic matter is the author's.)

Walter Channing is described as of medium height, florid complexion, with blue-gray eyes. He was devoted to his family and brought up five grandchildren. He was a great admirer of his brother William, and is said to have inaugurated a joke which had a considerable circulation. Some one calling at the doctor's house asked for Dr. Channing. His reply was, "Which Doctor Channing? My brother preaches and I practice." The ever-present fun in his make-up also cropped out in his lecture room. One summer afternoon, when after fruitless efforts to talk down an organ grinder, he remarked as he took his seat, "Apollo, gentlemen, was the god of music as well as of physic." As a lecturer and speaker, he had rare gifts and he was famous for his knowledge of biblical literature and Shakespeare. On one occasion he read the part of Macbeth in public, with Fanny Kemble reading that of Lady Macbeth. Walter Channing was twice married. He had one son, William Ellery 2nd, the poet, who died in Concord in 1901, and three daughters. He died July 27, 1876, at the age of ninety years and three months.

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NEW HAVEN HOSPITAL.

TUBERCULOSIS OF THE CERVIX*

By BRUCE ALEXANDER HARRIS, B.S., M.D., F.A.C.S.
BROOKLYN, NEW YORK

(From the Department of Obstetrics and Gynecology, Long Island College Hospital)

WHEN we consider the large percentage of the population suffering from tuberculosis in some form or other, it is not surprising to find the genital system involved in a considerable number of these cases. Yet the identification of a pelvic

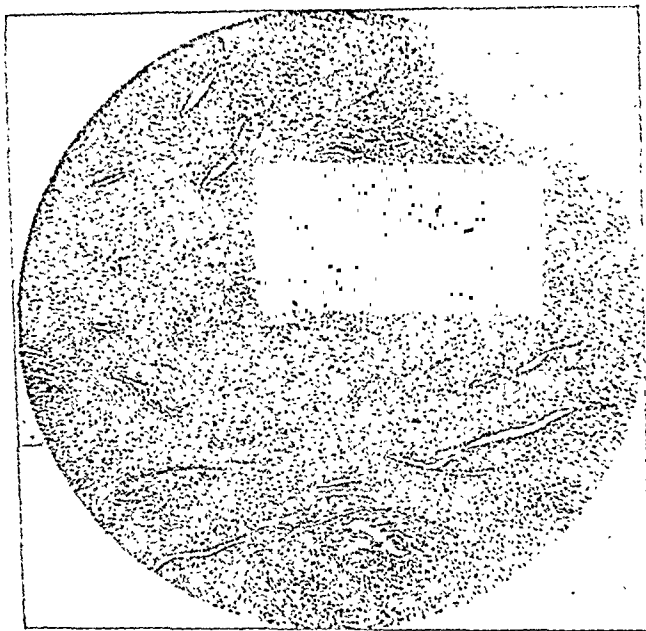


Fig. 1.—Section of cervix just beneath the portio. The stroma is infiltrated with moderate numbers of lymphocytes. Close to the area of ulceration is a large tubercle. The giant cells are prominent even under this magnification. X80.

lesion as tuberculous may not be made prior to operation. Frequently it remains for the pathologist to make the diagnosis. In cases, however, where the pelvic findings are associated with a known tuberculous lesion elsewhere in the body, the investigative procedures may be extended to rule out the possibility of a common etiologic factor.

Due to the insidious progress of this type of infection, and the tendency of the profession to fail to recognize tuberculous lesions of the reproductive system as such, a report of a case of cervical tuberculosis at this time might be justified.

*Read at a meeting of the Brooklyn Gynecological Society, March 7, 1930.

Primary cervical tuberculosis is exceedingly rare. In 1908 a very careful review of the literature on this subject resulted in only six cases of primary tuberculosis of the cervix. Cases reported by Klobb, Kaufmann, Michales, Broucha and Chaton, Brooks and Ferrari were accepted. Due to the quiescence or even resolution of the primary tuberculous lesion elsewhere in the body some of the above-mentioned carefully reviewed cases could still be secondary cervical lesions. While primary cervical tuberculosis is a possibility the lesion is generally considered to be secondary.

The clinical history of the patient forming the basis of this report is as follows: The patient, M. G., aged thirty-one, married, white, was referred from the Polhemus Clinic to the gynecologic wards of the Long Island College Hospital on Dr. Gibson's Service in November, 1924, with the diagnosis of a probable malignant lesion of the cervix. She complained of pain in the back and lower left quadrant of the abdomen, and of having frequent vaginal bleeding during the past two or three months.



Fig. 2.—Structure of the tubercle is fairly well defined. The clear epithelioid cells and the giant cells are well shown in the center. At the periphery lymphocytes are numerous. $\times 120$.

One sister died at the age of 22 with "hasty consumption."

The past history was negative except for an operation eight years ago for retroversion of the uterus and a curettage three years ago for bleeding following a spontaneous abortion at the third month.

The menstrual and intermenstrual histories were negative up to the present illness.

The obstetric history records six full-term pregnancies and two spontaneous abortions. The last pregnancy occurred three years ago and terminated in a spontaneous abortion at the third month.

Complete physical and laboratory examinations revealed negative findings except for a weak general appearance, moderate oral sepsis, and x-ray diagnosis of old apical tuberculous lesions in the lungs, tenderness on deep palpation over both lower quadrants of the abdomen, a bloody vaginal discharge, an enlarged, eroded,

and tender cervix, a slightly enlarged uterus which was limited in motion and sensitive and tender adnexa and parametrium. The parametrium was not indurated.

A diagnostic curettage of the uterine cavity and a biopsy of the cervix was done. The pathologic diagnosis on these specimens was: *Interstitial tuberculosis of the cervix and subacute inflammatory endometritis.*

Later when the patient's general condition had been sufficiently improved, the uterus, tubes, and ovaries were removed by abdominal section. Careful pathologic study of these specimens showed that the tuberculous lesion was confined to the cervix alone, and that the supposed tuberculous involvement of the adnexa was a pelvic inflammatory disease of gonorrheal origin.

The patient made a good recovery and since leaving the hospital her general condition has greatly improved.

(For discussion, see page 275.)

de Udaeta y Bernareggi, A.: Phototherapy in Gynecology. Rev. Espan. de obst. y gynec. 14: 105, 1929.

In the main, this article deals with the physics of the ultraviolet ray. Its mode of production is discussed very thoroughly, as well as the various lamps constructed to produce it. Its value in promoting the general health of the individual, and its effect on the different systems of the body are also touched upon.

In gynecology, it has been found useful, especially where other means of treatment have failed, and also in conjunction with other therapy. Such conditions as pruritus, eczema, condylomas, and irritation due to discharges, are definitely benefited and often cured. Kraurosis, the leucoplakias, and lupus vulvae have also been improved. Affections of the vagina are not as amenable.

Cervical erosions which the usual medications have failed to clear up respond readily to ultraviolet light. It should be used here in preference to operation. Chronic metritis responds readily. For uterine bleeding, e. g., due to fibroids, the treatment is beneficial in promoting hemostasis, but x-ray is much more efficacious. In pyosalpinx the results have been excellent, especially in combination with diathermy. Good results also have been obtained in dysmenorrhea, menorrhagia, oligomenorrhea, genital hypoplasia, menopausal symptoms, and vaginal metrorrhagia. Contraindications to its use are acute conditions and high temperature.

Dosage depends upon skin sensitivity, determined by exposing small areas at a distance of one meter for from one to six minutes and noting the maximum time at which an erythema not too intense is produced. Very strong doses are necessary for the cervix.

FRANK SPIELMAN.

PURPURA HEMORRHAGICA COMPLICATING PUERPERIUM*

BY HENRY B. BOLEY, M.D., BROOKLYN, N. Y.

PATIENT G. F., white, twenty-four years of age, was first seen by me on April 2, 1929, because of amenorrhea.

Menstruation began at fifteen years of age, regular, every twenty-eight days, lasting from three to four days, moderate in amount, not associated with pain or any other abnormal symptoms. Last menstrual period January 12, 1929, was normal in all respects. On February 15, patient spotted for about half a day.

Married for one year, contraceptives used for short time; no history of profuse bleeding at time of defloration.

Physical examination negative. Pelvic measurements normal; no masses or bony obstructions noted; normal pregnancy of about twelve weeks; adnexa negative.

Blood pressure ranged from 120/70 to 112/68; urine negative throughout; never complained of any untoward symptoms. On August 27, blood pressure showed slight elevation to 136/90; urine negative; no signs or symptoms of impending trouble. Precautionary measures were instituted, however, and patient was requested to return at weekly intervals. Condition remained unchanged until September 30. At that time patient showed all the classical signs and symptoms of impending eclampsia, blood pressure elevated 190/120; urine boiled solid, many hyaline and granular casts, few red blood cells.

Patient was admitted at once to the Jewish Hospital on September 30, about 1 P.M. Examination revealed puffiness of eyes, anxious expression; peculiar mottling of skin of the face; accentuation second aortic sound; pregnancy about thirty-seven weeks, fetal ovoid showed back to left, small parts to right, vertex below and engaged, breech above; fetal heart L.L.Q., good quality. Rectal examination: cervix effaced, os admitted tip of finger, membranes intact, vertex in midpelvis. Although patient was not experiencing pain, distinct contractions were visible. In view of the above findings, conservative management was deemed advisable. Within twelve hours after admission cervix was fully dilated; head at the spines. Membranes were artificially ruptured, episiotomy performed, and low blades applied. Normal living female child delivered, weighing 4 pounds 7 ounces; placenta and membranes expressed intact, episiotomy repaired.

There being no appreciable bleeding, and because of the hypertension, no pituitrin or ergot was given. Light ether anesthesia was used.

Immediately after delivery blood pressure was 100/70; pulse good quality; general condition good. Within twenty-four hours all signs and symptoms of toxemia disappeared except for slight trace of albumin.

The first twenty-four hours of the puerperium were normal; no rise in pulse, temperature, or respiration. On October 2 ecchymotic spots were noted on the abdomen and under both knees, as a result of the expression of the placenta, and the pressure of the metal leg holders.

The following morning the patient had a severe nose bleed which was only checked after nasal packing was used. At the same time, a marked change in the lochia was noted; it was more profuse and bright red in color. The uterus was well contracted, and in spite of oxytocics employed, the lochia continued in profuse quantity. Blood pressure 120/70.

On October 4, with the appearance of numerous petechiae over the breasts, abdomen, arms, and mucous membranes, purpuric areas at the sight of hyper-

*Presented at a meeting of the Brooklyn Gynecological Society, March 7, 1930.

dermic injections, a medical consultation was held. A blood transfusion was advised and a blood study was requested. Patient was now showing signs of blood loss. Temperature, pulse, and respiration were all elevated. Spleen was palpable. Blood transfusion was given, 350 c.c. Blood examination: Hb., 35 per cent; R.B.C., 1,650,000; W.B.C., 23,100; platelets, 90,000; bleeding time over fifteen minutes; clotting time, three and one-half minutes; clot retraction, none in twenty-four hours.

Her general condition did not improve. Medical and surgical consultation held. Consensus of opinion, immediate splenectomy. Patient transferred to Surgical Service. Splenectomy performed by Dr. Wm. Linder. Spleen $2\frac{1}{2}$ times normal size, dark and congested, studded with ecchymotic areas. The peritoneum and all organs which were visible were full of petechiae. It was extremely interesting to note that no sooner were the splenic vessels ligated than all bleeding from oozing surfaces ceased at once. Patient stood operation very well. A transfusion of 500 c.c. of blood was given immediately after the operation.

On October 7 episiotomy wound was noted breaking down, two large ecchymotic pressure sores noted on either side of coccyx. Blood one day postoperative, Hb., 33 per cent; R.B.C. 2,030,000; W.B.C., 20,000; platelets, 250,000 (compared to 90,000 before operation); bleeding time, one-half minute; clotting time, four minutes; patient appears in better condition.

October 8 and 9 condition fair; patient comfortable; no new petechiae noted; lochia less profuse; bleeding from nose and gums stopped. Temperature fluctuating 100-102° F.

October 10 transfusion of 400 c.c. of blood given.

October 16 patient complaining of pain in left chest on deep respiration; temperature 103°; pulse 120; respirations 28. Few moist râles at left base.

October 17, more definite signs of fluid and consolidation at left base.

October 19, patient toxic; temperature 105°; some cyanosis; x-ray revealed diffuse opacity at left base indicating pleural reaction with fluid; aspiration performed, 50 c.c. of straw-colored fluid removed.

October 20, patient getting progressively worse; appears septic; temperature 104°; blood culture sterile; extension of pulmonary signs over right middle lobe. Slight infection of operative sight.

October 21 patient died.

Baby was discharged from hospital in good condition and up to present time has shown no signs of the disease.

Pathologic report: spleen slate-colored, hard, enlarged $2\frac{1}{2}$ times normal; several ecchymotic areas on surface. Microscopically, moderate fibrosis with areas of hemorrhage.

This case is reported not because of the purpura hemorrhagica, although that condition is in itself a rare one, as is pointed out by Rushmore* in his review of this subject, but because of the fact that this symptom complex only manifested itself on the third day of the puerperium.

This case must naturally bring up the question as to the relationship of toxemia of pregnancy to purpura hemorrhagica complicating pregnancy and the puerperium. In the majority of cases reported, this condition was associated with some signs of toxemia. The case reported here is probably a case of latent purpura which was aggravated by the change in the metabolic processes or the toxins produced by the impending toxemia. As to the rationale of the treatment, I am of the opinion that this patient would have recovered from the splenectomy were it not for the complicating pulmonic infection which set in and caused her death.

205 HICKS STREET.

*AM. J. OBST. & GYN. 10: 553, 1925.

ANEMIA IN PREGNANCY

A FINAL REPORT ON THREE HUNDRED OBSERVED CASES

By JOHN H. MOORE, M.D., F.A.C.S., GRAND FORKS, N. D.

IN THE AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY for September, 1929, I made a preliminary report on 100 pregnant women upon whom routine blood examinations had been made to determine the average hemoglobin readings and the average red blood cell counts.

This work has been continued, following the procedure as outlined in the original article, and Tables I, II, and III are based upon a study of the 300 observed cases:

TABLE I

| NUMBER OF CASES | AVERAGE HG. | AVERAGE R.B.C. |
|-----------------|-------------|----------------|
| 300 | 79% | 4,342,610 |

TABLE II

| | NUMBER OF CASES | AVERAGE HG. | AVERAGE R.B.C. |
|------------|-----------------|-------------|----------------|
| Primiparae | 135 | 79.2% | 4,447,798 |
| Multiparae | 165 | 78.7% | 4,304,086 |

TABLE III

| Age | 50 OR LESS | 50-60 | 60-70 | 70-80 | 80-90 | 90 OR ABOVE |
|-----------------|------------|-------|-------|-------|-------|-------------|
| Number of cases | 3 | 18 | 28 | 103 | 116 | 32 |

The major complications encountered in this series are of interest: nephritis complicating pregnancy occurred in 10 cases; preeclamptic toxemia in 2 cases; eclampsia in 1 case; pyelitis of pregnancy in 2 cases; mitral stenosis in 2 cases; acute polyhydramnios in 2 cases, and syphilis in 4 cases.

CONCLUSIONS

1. In 300 observed cases taken consecutively from my private obstetric practice the average hemoglobin reading was 79 per cent, and the average red blood cell count was 4,342,610. This is unquestionably lower than the commonly accepted average for normal, nonpregnant women.

2. The lowest average readings occurred in the group of cases having nephritis as a complication of pregnancy; the patients with syphilis showed a lower average in red blood cells than the average of the series, but with practically no change in the hemoglobin average from that of the entire series.

3. No wide variation exists between multiparae and primiparae in either hemoglobin readings or red blood cell counts in this series.

4. Excluding all cases of gross pathology, fully 50 per cent of the patients of this series showed a reduction in hemoglobin readings and red blood cell counts sufficient to place them in need of therapeutic measures to combat the secondary anemia.

I am again indebted to Mrs. Helen G. Korstad, laboratory technician, for the hemoglobin determinations and red blood cell counts on the patients in this series.

NORTHWESTERN NATIONAL BANK BUILDING.

FATAL BRONCHIAL OBSTRUCTION IN THE NEWBORN

BY PAUL C. LANGAN, M.D., AKRON, OHIO

IT IS the purpose of this paper to report what I believe to be a heretofore undescribed cause of death in the newborn baby. Although the mechanics involved and a somewhat similar course of events have been seen repeatedly and reported in older patients suffering from foreign bodies in the air passages, I have been unable to find a report of a similar death in a newborn, although the mechanism is simple and the danger always present.

Numerous cases have been observed of a foreign body in a major or main stem bronchus in which the foreign body has been present for a sufficient time to pass through the stage of obstructive emphysema described by Manges, to reach the stage of obstructive atelectasis, and in which the foreign body is finally dislodged in some manner and failing to be expelled through the trachea by the first expiration, it follows the only air current downward and plugs the opposite main stem bronchus, with a fatal result. This has happened in attempt at bronchoscopic removal in which the foreign body has either been fragmented or has slipped from the grasp of the forcep, and is one of the most tragic complications of endoscopy. It has often happened spontaneously in cases where for some reason or other endoscopy has not been done.

In the case to be reported, Mrs. S. S., white, aged thirty-nine, para ix, at full term in an uncomplicated pregnancy was admitted to the hospital at twelve noon and placed in a room. Pains were every two minutes, the membranes had ruptured before admission and on admission a note was made of mucous discharge and the fact that there was no "bulging." The patient was prepared hastily and was being taken to the delivery room at 12:25 when a 4.2 kg. girl was born precipitately on the stretcher. The infant cried, showed no jaundice or other abnormalities and was placed in the nursery. It did very poorly, became cyanotic and dyspneic and lost weight rapidly, on the fourth day weighing 3.4 kg. Because of its condition it was then transferred to the Pediatric Ward and was referred to the x-ray department with suspicion of, and a request for treatment of a pathologic thymus. The x-ray report was, that no thymic pathology existed and that the left main stem bronchus was occluded either by a congenital stricture or some foreign body, nonopaque, probably mucus, causing a left side atelectasis. The infant was in an extremely poor condition and at about 11:00 A.M. of its sixth day of life, was given 20 c.c. whole blood intraperitoneally. Twenty minutes later it became very cyanotic and died.

The conclusion was that the foreign body, or a portion of it, had become dislodged and had followed the air current into the opposite bronchus, causing death.

This belief was substantiated by the postmortem findings of a plug of mucus in both the main stems of the bronchi which was classified by the pathologist as, in his opinion, not of respiratory tract origin.

Although this case is unusual in that the cause of death was accurately established, the circumstances leading to it are most commonplace, and it serves to demonstrate the value of the time-honored teaching that the first duty of the obstetrician is the removal of any secretion from the upper air passages of the newborn babe at the earliest possible moment. It is my belief that this condition would be found more often at postmortem if not only the trachea but the entire bronchial tree were carefully laid open.

ST. THOMAS HOSPITAL.

THE USE OF A TOURNIQUET FOR THE CONTROL OF THE ABSORPTION OF SOLUTION OF PITUITARY IN THE INDUCTION OF LABOR*

BY SAMUEL HANSON, A.M., M.D., STOCKTON, CALIF.

(From the San Joaquin General Hospital)

THE indications for the use of solution of pituitary in obstetric practice are at present sharply limited to the third stage of labor. In the leading clinics it is seldom used in the first and second stages, and only occasionally for the induction of labor. The well-known objection to solution of pituitary is its tendency to produce excessively powerful and even tetanic contractions of the uterus. If these dangerous potentialities of the drug could be reduced, its usefulness in obstetrics would be greatly extended.

In order to gain some control over the action of solution of pituitary, Hofbauer¹ recently proposed an intranasal method of administration. His procedure consists of the application to the inferior turbinate of a pledget of absorbent cotton saturated with solution of pituitary. It is thus possible, if necessary, to terminate promptly the absorption of the drug, by withdrawing the cotton pledget from the nasal cavity.

It occurred to me that the advantages of Hofbauer's method can be secured by other means, without resorting to the slow and rather uncertain absorption through a mucous membrane.

The method recommended is very simple: the absorption of the drug is controlled by means of a tourniquet applied above the point of injection.

In detail the procedure is as follows:

The patient's blood pressure is taken. The cuff of the sphygmomanometer is applied at the wrist and inflated up to a pressure just above the patient's systolic blood pressure. Three-tenths c.c. of the solution of pituitary (10 international

*Read before the California Northern District Medical Society at Stockton, Calif., April 8, 1930.

units per c.c.) is injected hypodermically below the level of the cuff. The pressure is then released for thirty seconds and reapplied for two minutes, alternately, for a period of twenty minutes. The rate of absorption is thus reduced to one-fifth of the normal rate. If the pains do not become excessive in strength or frequency by the end of the initial period of twenty minutes, it is safe to release the pressure permanently. However, should excessively powerful contractions develop at any time during the above period, constriction is immediately reapplied and is henceforth maintained for intervals of as long as ten minutes alternating with periods of relaxation of only ten seconds. In this manner absorption may be almost completely interrupted for half an hour or longer depending on the indications. The above procedure is, of course, very flexible. By varying the length of the intervals of constriction and relaxation it is possible to control the rate of absorption sufficiently to satisfy almost any requirement, provided the initial dose of the drug is a reasonable one.

The time intervals as above recommended were derived from a series of 36 clinical tests performed on 25 patients past term, or in the beginning of the first stage of labor. Two-tenths to 0.5 c.c. of solution of pituitary was injected hypodermically and the tourniquet released periodically. The duration and frequency of the pains were timed carefully. These experiments showed that solution of pituitary is absorbed with great rapidity. If an effect was produced at all, in every instance it was obtained with an absorption time* of one and one-half to three minutes. Consequently, if the tourniquet is to be used effectively the intervals allowed for absorption must be very short—not longer than 30 seconds. It was also found that if the pains do not become excessively strong with an absorption time of 4 minutes, overdosage from further absorption need not be feared, and the constriction may be permanently released.

The pressure is applied at the wrist for the reason that it causes much less discomfort there than it does higher up on the arm. In fact, it was a revelation to find how easily continuous and complete interruption of the circulation can be tolerated at the wrist for periods of ten minutes at intervals of ten seconds, for half an hour or even longer.

The principle on which the method is based is, of course, not new. A familiar example is the intermittent application of a tourniquet to an extremity to retard the absorption of the poison in cases of snake bite. The principle of temporary circulatory interruption is, however, especially applicable to solution of pituitary, since the action of this drug is of relatively very short duration.

The present method is offered primarily as an aid to the induction of labor. It is not intended to give a sense of security or encouragement for the indiscriminate use of the drug in the first and second stages of labor. The method proposed is especially recommended in Watson's procedure,² which consists of a preliminary sensitization of the uterus with castor oil and quinine, and the subsequent administration of solution of pituitary in 0.5 c.c. doses every thirty minutes† for

*The phrase "absorption time" is used to designate the total length of a group of intervals during which absorption is allowed to take place. For example, if the constriction is released for thirty seconds every two minutes for a period of fifteen minutes the absorption time is three minutes.

†The dose at present generally recommended is 0.3 c.c. or less. In adopting the present technic to Watson's method, the injections should be given forty-five minutes instead of thirty minutes apart, to allow for the time lost during the intervals of constriction.

6 doses. The method may also be applied where solution of pituitary is indicated as an adjuvant to the induction of labor with the hydrostatic bag.

REFERENCES

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1009 MEDICO-DENTAL BUILDING.

A DIRECTOR FOR THE VAGINAL OCCLUSIVE PESSARY*

BY MAX D. MAYER, M.D., NEW YORK

(*Adjunct Gynecologist, Mt. Sinai Hospital*)

THE recent change of attitude toward contraception, where contraception is indicated, has in some degree outstripped the improvement in efficacy and applicability of available contraceptives. The renewed interest and more widespread use of the Mensinga (or Ramses) type of pessary has drawn attention to certain difficulties in its use.

Four troublesome features are: (1) the occasional difficulty, or even impossibility, of placing it in the correct position with the upper edge in the posterior fornix; (2) the occasional uncertainty on the part of the wearer as to its exact position; (3) the necessity of manipulation and fingering with the present technic of introduction; (4) the time and patience occasionally required of the doctor in instructing the patient.

These objections seem to have been adequately met by the use of the simple instrument I have devised,¹ which is pictured below.

This is an applicator or introducer, shaped like an elongated "S," and not unlike a tongue depressor. It is made of aluminum, and is seven and one-half inches long, three-quarters of an inch wide, and one-eighth of an inch thick, and has at one end a finger-like thickening, at the extremity of which is a transverse groove (Fig. 1). Into this groove fits the thick rim of the vaginal diaphragm, which is then stretched over the superior surface of the rod and held in a taut position by the thumb of the patient, whose forefinger is at the outer end of the instrument (Fig. 2). The lubricated diaphragm is then pressed into the vagina with one simple sweep of the hand, and automatically directed to its proper position by the shape of the instrument (Fig. 3). The instrument is then withdrawn (Fig. 4) and does not catch or dislocate the pessary. It is recommended not only for those patients who simply cannot place a pessary without it, but for routine use with this

*From the Committee on Maternal Health.

¹This director has been made for me by the Durex Products, Inc., 156 Fifth Avenue, New York City.

type of pessary. It will eliminate the difficult contraceptive problem presented by the very long vagina with cervix pointing far backward.

It is possible to use a tongue depressor, but this may cut the rubber and it lacks the curve that enables the cup to pass the projecting cer-

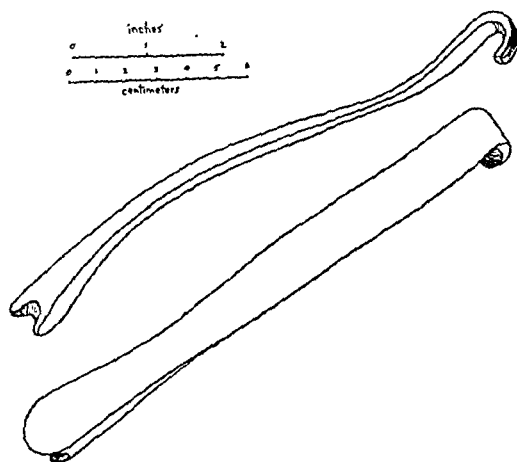


Fig. 1.—Director for placing pessary.

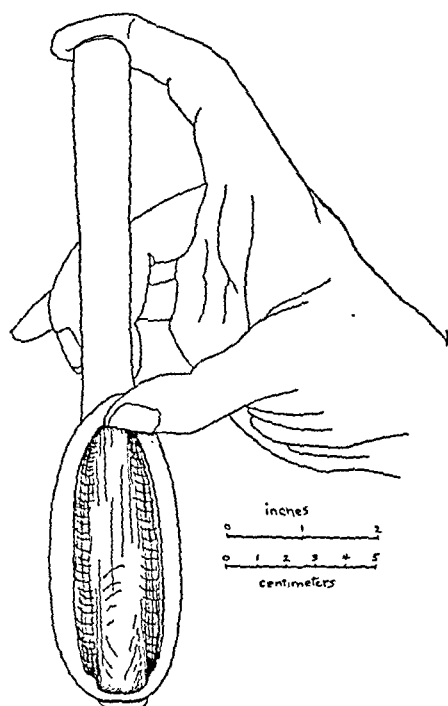


Fig. 2.—Insertion of pessary with aid of director.

vix by hugging the posterior vaginal wall. The applicator formerly sold by dealers, which is an incurved lateral compressor, adds to the bulk of the mass to be introduced and is inelastic so that rigid metal and not compressible rubber must be pushed past the entrance into the vagina.

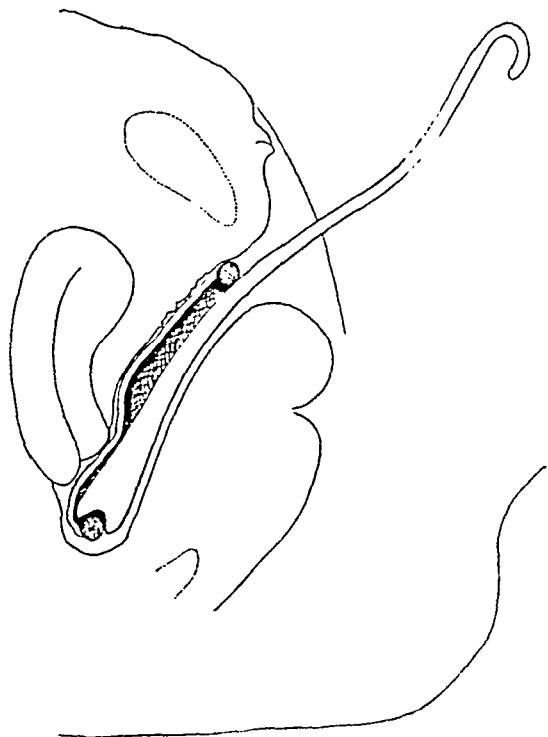


Fig. 3.

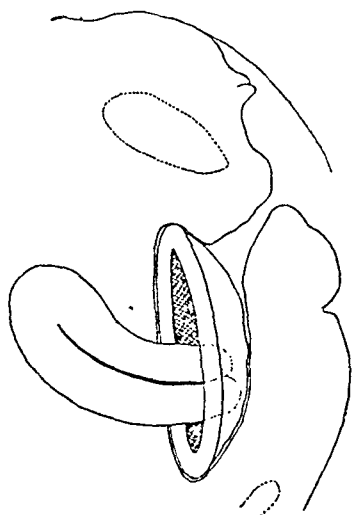


Fig. 4.

Fig. 3.—Cross-section of body showing director placing farthest part of circle of pessary beyond cervix.

Fig. 4.—Correct placing of pessary. Anterior bar well caught behind subpubic arch. Cervix is covered.

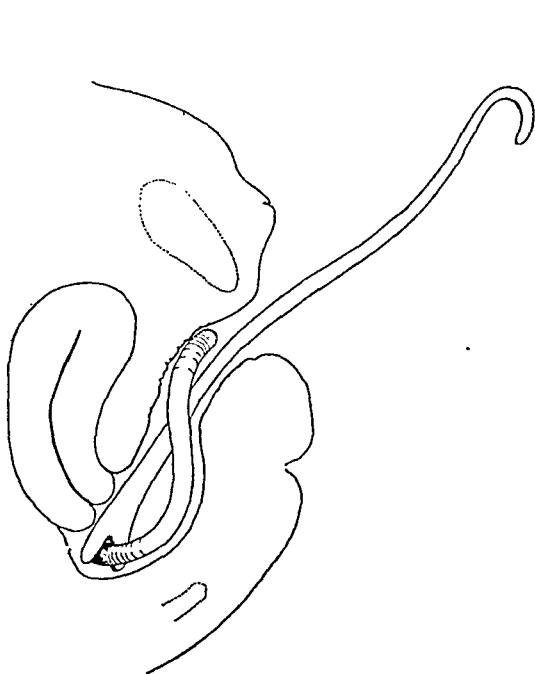


Fig. 5.

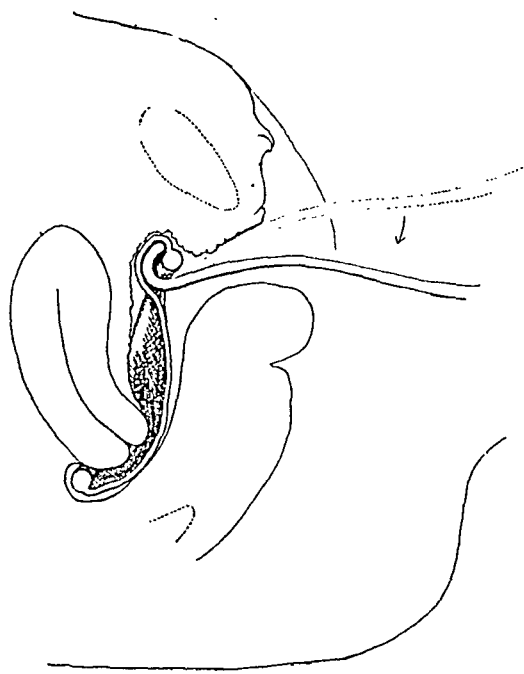


Fig. 6.

Fig. 5.—Director placing farther rim of Smith pessary beyond cervix into posterior fornix.

Fig. 6.—Use of director to remove pessary.

The same device (Fig. 5) enables wearers of Smith or Hodge pessaries to remove and replace them, in those cases where removal does not dislodge or displace the repositd uterus. It is an efficient substitute for the gynecologic finger, of which it exactly duplicates the mechanism and action.

For removal of either the contraceptive diaphragm or the Smith pessary, the end opposite the grooved tip bears a blunt hook with a curve adapted to the thickness of the usual pessaries (Fig. 6). As a well-fitting pessary of either variety sits rather snugly up behind the pubes a patient sometimes finds difficulty in seizing this anterior extremity with her finger to draw it downward and backward before withdrawal. The instrument constitutes an extension of the hooked finger and its use is obvious as shown by the diagram (Fig. 6).

Instruction in the use of the instrument takes far less time than the reading of these few lines. My own experience with instruction shows that one demonstration of placing and removal suffices.

Society Transactions

NEW YORK OBSTETRICAL SOCIETY

MEETING OF MARCH 11, 1930

DR. J. H. TELFAIR presented a report on **Complete Inversion of the Uterus During Labor**, and said that this was the second case where he reinverted the uterus by simply pushing it up into the pelvis, and in each case it was rather easy to replace the uterus in normal position through the noncontracted cervical muscle fibers.

DISCUSSION

DR. A. M. JUDD.—I have seen but two cases of inversion of the uterus. One was acute and the patient died within a few minutes after I reduced it. The other existed for nine months after its occurrence. The patient was extremely anemic and in that case I did a Spinelli operation. The patient recovered and subsequently had a baby after that normally.

DR. ELIOT BISHOP.—I have seen only one case of inversion of the uterus, five or six hours after delivery and in some shock. The patient was referred to the hospital after delivery at home. At that time the Spinelli was the operation of choice, unless the uterus could be easily repositioned, and not being able to reduce the uterus in that case I attacked it by the Spinelli method, and the patient died on the operating table.

A newer and better method of attack is described by Huntington, Kellogg and Irving, of Boston, in an article published by them in the *AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY* 15: 34, 1928. Their practice is to immediately transfuse the patient to combat shock, the major problem, and do a quick laparotomy; the inversion is reduced in the reverse order of occurrence, using Allis clamps. This is much more simple than the complicated Spinelli procedure, which also invades the peritoneal cavity, though from below.

DR. EDWIN W. HOLLADAY described the **Repair of an Intractable Vesicovaginal Fistula**. The successful, complete cure of this case was felt to be due to several minor points in technic and for that reason it is presented.

The patient, Mrs. M. P., Greek, thirty-one years of age, para v, was about five feet tall and weighed 155 pounds. Her family history and previous medical history had no bearing on the present condition.

Her present complaint began five years ago following the birth of her fourth child, since which time she has had incontinence of urine. During this time she has undergone five unsuccessful operations by different operators in other cities. Three of these operations were vaginal, one was suprapubic, and one was an attempt at vaginal followed by a suprapubic operation. Following the first operation a diagnosis of bilateral renal tuberculosis was made from cystoscopic examination. In addition, following the third operation a cesarean section was done, most likely because of the fistula and the extensive scar tissue present. She had thus undergone six operations in less than four years. She was admitted to Bellevue

Hospital September 23, 1929, complaining of complete incontinence of urine. Physical examination showed a very adipose female, thirty-one years of age, not acutely ill. The abdomen showed very dense and extensive scars in the suprapubic region. There was a relaxed parous pelvic floor. The entire vulva was badly excoriated. The cervix was high up and fixed by very extensive scar tissue. The fundus was retroverted and not well palpated, due to scar tissue. On the anterior wall there was a fistula admitting almost three fingers, so that the contracted bladder could easily be palpated with the examining fingers. The fistula was just behind the proximal end of the urethra and measured about $1\frac{1}{2}$ inches in diameter. It was located more to the right side, lying very close to the right ureteral orifice. Bladder mucosa could easily be seen running into the extensive scar on the anterior lip of the cervix. While the patient was being studied she was kept in bed, and efforts were made to improve the local condition of the tissues. She was operated upon October 31, 1929 in the gynecologic service of Bellevue Hospital.

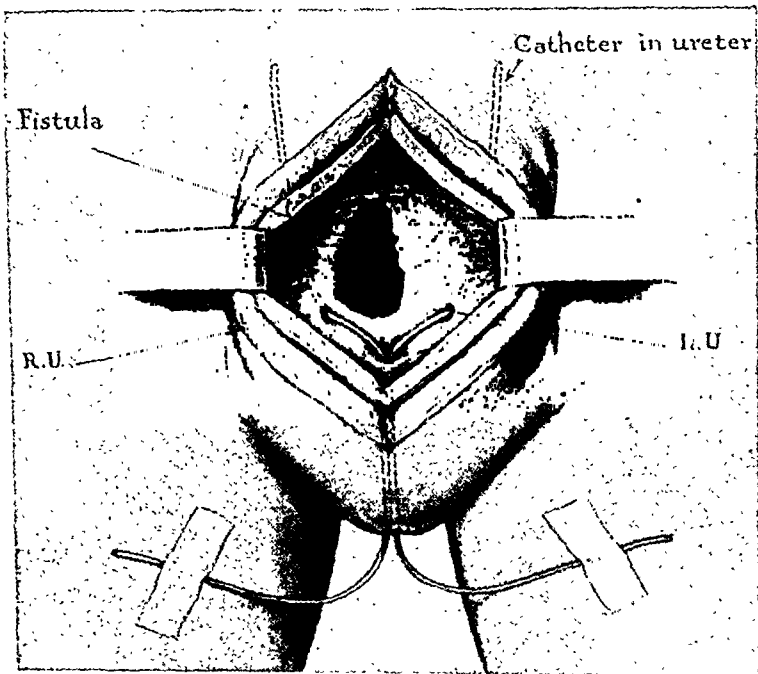


Fig. 1.

A longitudinal incision was made through the dense suprapubic scar, and the peritoneal cavity was intentionally opened to facilitate identifying the contracted bladder bound up in the thick scar tissue. The bladder was located and incised. With the use of Deaver retractors and the Cameron light the ureters were located and No. 6 catheters inserted 15 cm. within the ureteral orifices. An endoscope was passed and the ends of the catheters were brought out through the urethra and fastened to the thigh. The bladder wound was covered over and left open while the vaginal repair was being done. A Schuchardt paravaginal incision was made on the left side to make the fistula more accessible. The cervix was grasped with a tenaculum but could not be pulled down. Scar tissue around the edge of the fistula was excised. The vaginal mucosa was separated. With great difficulty the bladder was mobilized as much as possible around the periphery of the fistula from the surrounding scar tissue. On the right side, due to the proximity of the right ureter, very little free bladder edge could be obtained. At this point the catheter in the ureter fortunately saved us from cutting the ureter. The scar

tissue on the mobilized bladder edge was then excised. It was then seen that in spite of as wide mobilization as could be obtained it would be impossible to use the usual interrupted sutures in the bladder. A purse-string suture of No. 0 catgut was passed around the bladder opening and the edge inverted into the bladder as it was tied. A second purse-string suture of No. 1 chromic catgut was passed outside of the first suture. A third similar purse-string suture was then passed. Interrupted chromic sutures were then placed in the fascia to reinforce the bladder closure. Some scar tissue in the vaginal mucosa was then excised and the edges brought together with interrupted chromic sutures. The Schuchardt incision was closed with interrupted sutures in layers. The bladder was then inspected through the suprapubic wound and the catheters were found in place and the fistula site well closed. The bladder was closed by interrupted sutures. A mushroom catheter was inserted and fastened with a purse-string suture. The muscle and fascia were closed with interrupted sutures and the skin approximated with silkworm gut.

After-treatment: The ureteral catheters were left in place for six and seven days respectively, being irrigated every three hours with 1:5000 acriflavine. The suprapubic catheter was connected with a bottle and irrigated twice a day with acriflavine. It was removed on the tenth day and the wound gradually healed. The patient was discharged twenty-one days later, on November 21, in good condition. At the return clinic in January she was found to be completely healed, with no fistula and no leakage. She states that she can easily retain her urine for several hours without distress and that her capacity is increasing.

Summary: 1. After five previous unsuccessful operations the patient was completely cured by a combined suprapubic and vaginal operation.

2. Suprapubic insertion of ureteral catheters was feasible even when insertion by urethra was impossible.

3. Purse-string sutures of the bladder opening were utilized where interrupted sutures were impractical.

4. Ureteral catheters were left in place for six days without harm to the patient.

5. Combined suprapubic drainage and drainage by ureteral catheters kept the bladder dry, allowing union to take place.

DISCUSSION

DR. F. C. HOLDEN.—This combined suprapubic and ureteral catheterization was done years ago by Kelly.

Our patient was in the ward about a month before we attempted to do anything about it, and we gave her a good deal of consideration. We have treated another similar case, not similar in the size of the fistula, but in the fact that she had been operated upon six times for an intractable fistula. That patient was operated upon by this same procedure and we are quite sure we have cured her.

DR. H. D. FURNISS.—Two points are worthy of discussion. One is that the bladder can be opened transperitoneally without much danger of peritonitis; in fact, some of the German operators have deliberately repaired many of these vesiovaginal fistulas by the transperitoneal operation, instead of doing it suprapubically and extraperitoneally.

Another point in technic is that if the operator does not want to enter the peritoneum from above, he can make an incision in the bladder transversely and enlarge it to any degree without danger of cutting the peritoneal reflection and entering the peritoneum.

DR. HOLLADAY (closing).—I desire to correct the impression of Dr. Furniss that this bladder was attacked transperitoneally. The peritoneal cavity was en-

tered just to allow of the bladder being located. The scar tissue was so dense that it was just like cartilage for two inches in breadth. After the bladder was opened the peritoneal cavity was closed.

DR. ROBERT T. FRANK read a paper entitled **Progress in Endocrinology of Interest to the Gynecologist and Obstetrician.** (For original article see page 215.)

DISCUSSION

DR. W. H. CARY.—I would like to ask if the female sex hormone would be effective in helping certain cases of sterility in which probably there is a failure of the ovum to become implanted and nourished by the endometrium. If I understood him correctly, the female sex hormone does cause hypertrophy and congestion of the uterus.

I would also like to ask if the endometrium possibly has some direct or indirect hormone action.

DR. R. T. FRANK.—Dr. Coe mentioned a very interesting group of cases where development has lagged behind. We see two types of these, those in which no signs of puberty occur, individuals who are almost eunuchoid, in whom the secondary sex characteristics have not developed; others who are typically feminine, who have well-developed breasts, hair distribution, larynx, fat distribution, etc. In the former we do not expect, and do not find any evidence of ovarian activity, as far as our investigations go, but in the others, although they may never have menstruated, we do find the hormone in the blood in some cases. Several cases are on record of patients who have never menstruated and have had children.

Dr. Cary has brought up a very interesting phase of sterility, the investigation of which is only in its infancy at present. The subject is so vast that it is impossible for me to enter into any sort of details here. I merely want to say that in gauging and evaluating sterility there are a number of possibilities; for example, ovum production may be defective; in the next place, the uterine endometrial reaction may be defective in two ways, in the one that the necessary pregravid change does not take place. Some very recent work of Corner's is very illuminating in this regard. He feels that the aqueous extract of the corpus luteum, to which I referred, is the extract which produces the endometrial change. I believe that the work of Allen and Pratt and that of others who have worked on monkeys and who are able to get a pregravid change in the uterus of a castrated monkey with nothing but the female sex hormone is incontrovertible. On the other hand, Corner has demonstrated one thing beyond doubt; he has been able to remove the corpora lutea in impregnated animals before the ova have reached the uterus and has allowed them to imbed and reach maturity, normal labor eventually taking place, by the exhibition of this aqueous extract of the corpus luteum, a problem which had previously baffled all investigators.

The beginning of the modern endocrinology is really based on the work of Born and Fränkl, who showed that the corpus luteum was necessary for nidation, and no means was found until the extract of Corner's was obtained in making the ovum take root unless the corpus luteum was present. That is not controverted by the fact that after the ovum once has taken root the corpus luteum can be removed, but in order to imbed, the corpus luteum secretion is necessary.

DR. F. E. KEENE AND DR. R. A. KIMBROUGH, JR., of Philadelphia, read a paper (by invitation) entitled **Fibromyoma Uteri, Treatment and End-Results.** (For original article see page 198.)

DISCUSSION

DR. W. P. HEALY.—It is quite impossible, in my opinion, to take issue with any of the statements in this report, which represents a sound and sane deduction from actual experience as we see it today in the treatment of this benign lesion in the uterus.

There are one or two points that stand out which may possibly be worth emphasizing, one of which is the treatment of the patient suffering from anemia as the result of her myomas, in which you feel that you would prefer a surgical method of approach, but it is quite out of the question to begin in that way because of the anemia. We have found that the preferable way to get the patient in condition for surgery is by the use of the roentgen ray. We do not attempt to approach the treatment of that type of case with intrauterine application of radium, and it is very interesting to note that even an extremely large tumor will occasionally diminish so appreciably in size that within a short time, two or three months, while the patient's general health is improving, you may begin to doubt the necessity of carrying out the surgical procedure that was originally contemplated. This improvement is brought about entirely without the use of transfusion or any other form of therapy except certain medical measures and the use of the roentgen ray.

Then as to the association of malignant changes in the uterine endometrium with the presence of myomas: I have emphasized a good many times, and I still think it most desirable to do so, that the risk of a mistake in diagnosis is not in the younger woman before the age of the menopause, but is in the woman after the menopause who is found to have uterine myomas and who has again begun to bleed. That woman is seldom bleeding from myomas; she is nearly always bleeding from cancer of the corporeal endometrium and should not be treated by radiation therapy in any form, unless diagnostic curettage is first carried out to clear up the question of malignant change complicating the myomas.

It is interesting to note the infrequency with which we meet sarcoma in the uterus since we have been using radiation therapy for the treatment of myomas. I am of the opinion that many of these cases of sarcoma of the uterus, which develop, as you know, more often from the benign myoma than from the uterine musculature, are radiosensitive, and that, in all probability, in treating cases of bleeding uteri which we assume are due to myomas, we are now curing a certain number of cases of sarcoma.

DR. H. C. COE.—Dr. Healy emphasized an important point when he said that we should never lose sight of the fact that a patient with myomas may have a beginning carcinoma of the fundus. That has been impressed on my mind several times, once as a most unexpected result of a curettage in a case with no symptoms pointing to malignant disease. The pathologist reported an early adenocarcinoma. I operated upon that patient twelve years ago and she is well today. Two years ago at the Woman's Hospital I had a woman fifty-one years of age, who was in perfect health, but had a history of irregular bleeding. She had an interstitial fibroid of the fundus and, naturally, I thought that the bleeding was due to that condition. I curetted her and applied 1200 mg. hr. of radium. The report from the pathologist did not come in until after she had left the hospital. It was adenocarcinoma. She had a prolapse of the rectum and I persuaded her to return so that I could do a Whitehead operation. I not only did the Whitehead but took advantage of the opportunity to perform a vaginal hysterectomy at the same time. She was so much interested in the rectal condition that she never knew anything about the hysterectomy until later. She reports regularly and is in perfect health.

DR. W. T. DANNREUTHER.—In the first place, I would suggest that a latent salpingitis constitutes more than a contraindication to radiation. It should be regarded as a real hazard, whether coexisting with a myoma or in the presence

of carcinoma. In three instances in my experience radiation has been followed in less than thirty-six hours by acute pelvic peritonitis; twice in cases of carcinoma, and once in a case of fibroma. In all three of these, the patients were carefully examined to exclude the presence of a latent tubal infection, and no evidence of salpingitis could be found on palpation. However, it must have been present. All of my patients recovered, but one of my colleagues in the Post-Graduate Hospital had a similar experience and the patient died.

I was particularly interested in the mention of eight patients in whom myomectomy was done, none of whom became pregnant. The more I review my past experience with myomectomy, the less I am inclined to utilize it in the future. I performed a hysterectomy last week on a patient on whom I did a myomectomy six and a half years ago, and in the past twelve months I have reoperated upon three other patients, all of whom had had myomectomies five or more years previously.

My experience parallels that of the essayist; I have not observed a single patient on whom I have done a myomectomy who became pregnant afterward. This may have been simply my misfortune; or perhaps I have not done enough of them.

I also desire to suggest that a gynecologist who has had a reasonable experience with radium therapy, and who adapts his dosage and filtration to the size of the uterus, the amount of bleeding, the vital resistance of the patient, and takes into consideration all other factors which may be of importance in estimating the proper dosage, can use intrauterine radium therapy in the treatment of small intramural bleeding fibroids, even in the woman of childbearing age, with satisfactory results and without inducing a premature menopause.

DR. E. T. HULL.—I would like to say a word in favor of myomectomy during the childbearing period because my experience has been different.

I can recall three cases in the last three years where I have done a myomectomy and have subsequently delivered the patient in each instance.

I feel that there are too many uteri taken out of young women, and it is surprising to me that when you start out to enucleate one fibroid after another, you find, when you get through, that you have a pretty good uterus. The most striking case I have in mind was one in which I removed thirteen fibroids from the uterus of a young married woman. On opening the abdomen the pelvis was found filled with a mass of nodules, ranging in size from an English walnut to that of a lemon. It did not look like much of a uterus, but she was very anxious to have a baby, so I enucleated the fibroids and inside of a year she was pregnant and I delivered her. Another case I have in mind was that of a sterile woman who had been married twelve years. She had a history of long-continued menorrhagia. Three curettages had been done and I did a fourth with permission to open the abdomen if I found reason therefor. On the posterior wall of the uterus there was a convexity. I split the posterior wall of the uterus and enucleated a fibroid the size of a hickory nut. Inside of three months the patient became pregnant and I delivered her at full term.

I believe many of these uteri are removed where they could very well be enucleated of their fibroid growth, even multiple fibroids, and when this is done many of them, in my experience, become pregnant.

DR. H. B. MATTHEWS.—I would like to know if Dr. Kimbrough always conserves the ovary within the pelvis or transplants it after the method of Blair-Bell, in the rectus muscle, or inguinal canal, or some other suitable place.

DR. R. T. FRANK.—About fifteen years ago I gathered 500 cases of fibromas among which 20 per cent were treated by radiotherapy. Some ten years later Lockyer of London, published 500 cases in which his percentage was around 19.5, if I remember rightly. The only point that I would like to bring out is that al-

though we used radiotherapy in 20 per cent, in a huge majority of these, x-ray instead of radium was used, showing that the radio activity is really the important factor rather than the method by which it is applied.

Like Dr. Dannreuther, I use myomectomy less and less, but in extenuation I wish to say and to emphasize the fact that the nature of the speaker's paper prevented him from suggesting perhaps as clearly as he might have desired that many fibroids require no treatment. In 50 per cent of fibroids of my series I found that no intervention of any kind was required, and I think, for the guidance of the general practitioner, that this fact should be emphasized more and more, because patients are very much disquieted by being told that they have fibroids and then they go around for specialistic advice which very often is extremely varied in its character.

DR. A. W. BINGHAM.—I would like to ask the doctor why radium was used more than the x-ray, particularly when the x-ray is simpler and gives us uniformly good results.

DR. KIMBROUGH (closing).—In reference to conservation of the ovary, I would say that almost without exception we conserve the ovary in its original site; its blood supply there is natural, and we feel this is followed by better end-results. Occasionally an indication will arise for implantation by the method of Blair-Bell into the rectus muscle. In this series the ovaries were all conserved *in situ*.

In reference to the use of radium in a large number of cases: we feel that diagnostic curettage is indicated in all cases and should be carried out, unless there is a definite contraindication to anesthesia. While we have the patient under anesthesia we prefer to give a simple treatment which is over in twelve to eighteen hours rather than to have the patient come in for diagnostic curettage and remain in the hospital four or five days for that, and then come back six, eight, or ten times for x-ray treatment later on. It is merely a question of conservation of the patient's time, and makes for simplicity.

PHILADELPHIA OBSTETRICAL SOCIETY

MEETING OF FEBRUARY 6, 1930

DR. GEORGE M. BOYD reported two cases of **Extrauterine Pregnancy at Full Term.**

CASE 1.—Mrs. A., colored, aged twenty-six, had had two children without difficulty. She was admitted to the waiting ward of the Philadelphia Lying-in Charity December 21, 1895, in the last month of gestation. The child was found to be in a transverse position, and an unusual proximity of the fetal membranes to the abdominal wall was noted, the pulsating umbilical cord being detected through the skin. The uterus could be felt above the pubic symphysis and it was the size of a twelve weeks' pregnancy. The patient's pulse and temperature were normal and she had little discomfort until January 16, the date fixed for her delivery. Then suddenly, the child died, and she complained of a colicky pain about the umbilicus. Her pulse, which heretofore had been normal, became very rapid, and operation was imperative.

Operation January 18, 1896. Under anesthesia, the uterus could be better outlined; the depth of its cavity was 9 cm. and it contained clots and decidual tissue. An incision along the outer border of the right rectus muscle revealed the fetal sac adherent to the parietal peritoneum. On incising the sac, there was profuse hemorrhage and a dead macerated child was extracted which weighed 3250 gm. ($7\frac{1}{4}$

pounds). The uterus was now found to be posterior to the sac. The pregnancy had evidently had its origin in the right tube, primarily, and the placenta was implanted on the posterior surface of the broad ligament and extended over the pelvic cavity and uterus. Hemorrhage was now so pronounced and the patient's condition so serious that no attempt was made to separate it. The fetal sac was firmly packed with gauze and the patient stimulated, but the same day she died of hemorrhage and shock.

CASE 2.—Mrs. W., colored, aged twenty-one and a primipara, was admitted to the Graduate Hospital, April 25, 1929. Her last period came on August 1, 1928, and continued for three days. In October, about two months after this date, she developed considerable pain in the right lower abdomen and she called in her physician. She states that she remained in bed one week when the symptoms disappeared. At this date the pregnancy probably became abdominal. She never had any bloody discharge and had little discomfort. At the eighth month of

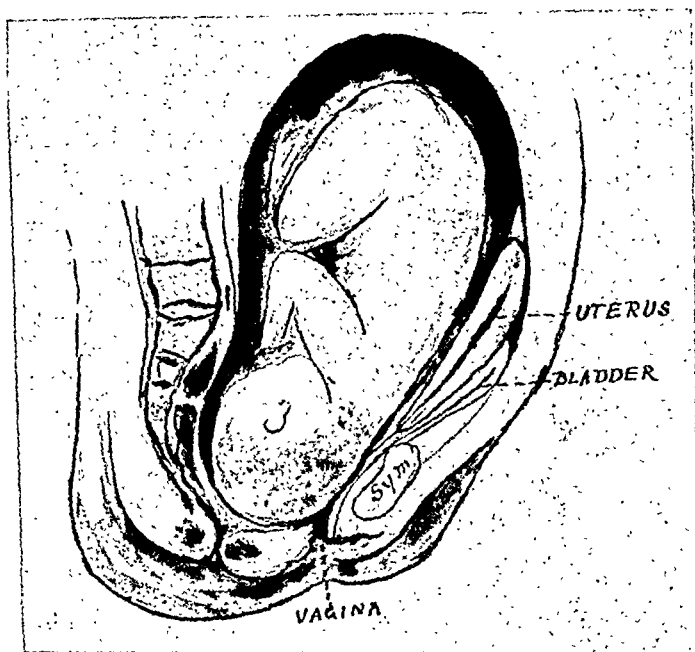


Fig. 1.—Shows the head well in the pelvis pressing down on the pelvic floor. Uterus enlarged and flattened out in front.

gestation, she came to the hospital prenatal clinic where her general condition was so satisfactory that at first extrauterine pregnancy was not recognized. April 8, the last time she visited the clinic, she was found to be in the last month of gestation. The abdomen was pyriform in shape. The abdominal wall was thick and tense and it was difficult to outline the fetal ovoid but the fetal heart could be easily heard to the left and below the umbilicus. Above the pubic symphysis and pushed to the left side was found a more resistant mass which proved later to be the uterus flattened out and the size of a three months' pregnancy. Rectal examination revealed the head well engaged in the pelvis and to the level of the ischial spines. It was not until later when a vaginal examination was made that the diagnosis of extrauterine pregnancy was confirmed. In studying the position of the head, it was found that while it was in the pelvis, it was not in the uterus nor was it in the vagina. A thin membrane between the examining finger and the head was found to be the septum between the vagina and Douglas' pouch stretched to an almost incredible thinness. (Fig. 1.) The cervix could not

at first be found for the well-developed head had lifted the uterus completely out of the pelvis and only with great difficulty was the cervix finally reached high up above the symphysis to the left side. (Fig. 2.) So thin was the septum between the head and the vaginal wall and so difficult was it to find the cervix that it is conceivable that the same might have been mistaken for the fetal membranes, possibly punctured and an attempt made at delivery through the vagina. Upon admission to the hospital April 25, she complained of slight pains throughout the abdomen and bladder irritability. These symptoms had developed that morning. Her pulse and temperature were normal and the fetal heart easily heard. As her condition was so satisfactory, it was decided to operate the following morning.

Operation: An incision, 16 cm. in length, was made to the right of the median line. Free fluid was found in the abdominal cavity and a small rent in the gestation sac was discovered. The uterus, about the size of a three months' pregnancy

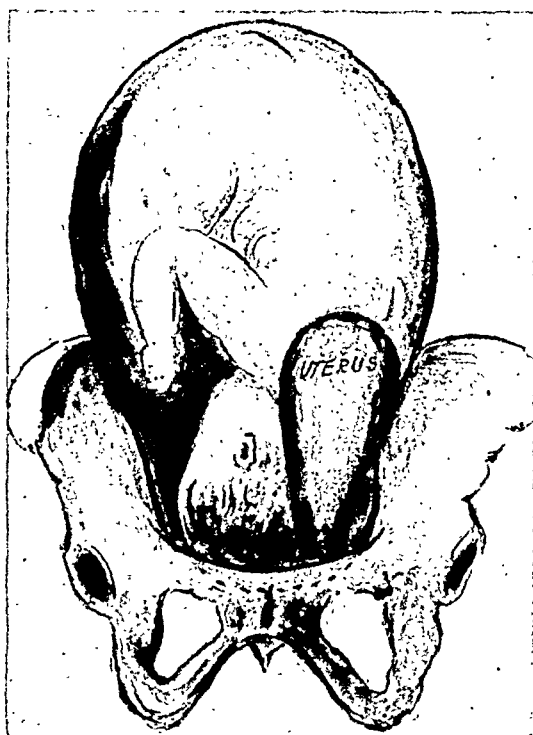


Fig. 2.—The uterus in front of the head and lifted out of the pelvis.

was found in front of the fetal sac and displaced to the left side by the presenting part. The left oviduct was normal. The dorsal plane of the child was on the left side and the head well in the pelvis as in a normal uterine pregnancy (first position of the vertex). It was now found that the omentum covered a large portion of the fetal sac. In enlarging the rent above mentioned to deliver the child, there was profuse bleeding caused by separation of that portion of the placenta which was attached to the posterior surface of the omentum. The child was rapidly delivered, was in no way deformed and soon began to cry. Although of normal size in frame, it was poorly nourished weighing 2850 gm. (5 pounds, 15 ounces). The pregnancy had its origin primarily, in the right tube, probably tubal abortion as no injury to that organ was discovered. The placenta, which was annular in shape, was attached to the tube, the posterior surface of the right broad ligament and omentum. It was prevented from encroaching upon the cavity of the true pelvis by the growing fetal head. It received its blood supply from

the omental vessels and branches of the ovarian and uterine arteries. When the child was delivered and the sac freed of blood, it was decided that the placenta could be removed without too great a risk of hemorrhage. This was carried out first by removing a large portion of the omentum, then by ligating the ovarian and uterine arteries. With this control of the blood supply, the placenta could be peeled out easily with very little bleeding. As it was impossible to remove the entire sac, particularly that portion occupying the pelvic cavity and as there was some oozing of blood, a small abdominal drainage tube of soft rubber was placed in Douglas' pouch and fixed at the lower end of the incision. The patient was returned to her bed with a pulse of 120 and given 500 c.c. of a 10 per cent glucose solution intravenously. On the ninth day postoperative, she passed a foul-smelling mass from the vagina which on pathologic study proved to be a decidual cast of the uterus. On the twelfth day although her general condition seemed to be satisfactory, a blood count showed 1,910,000 erythrocytes, 31,950 leucocytes, and the hemoglobin 37 per cent. She was given a blood transfusion of 575 c.c. This was followed by an immediate increase in the red count to 3,000,000 and an increase in the hemoglobin to 50 per cent. From this time on the patient's convalescence was satisfactory and May 28, 1929, thirty-two days after the operation, she was discharged in good condition, the child having gained over one pound. Nine months later the baby weighed 16 pounds. Both are in good health.

These cases are interesting from several standpoints. It was surprising how little discomfort these patients had until the end of gestation. The first case should have been operated upon at an earlier date when the child was alive and could have been saved. It occurred thirty-four years ago and the delay in operating was probably prompted by the thought that after the death of the child and placental separation had taken place, the mother's life would be safeguarded.

We were fortunate in the second case in finding it possible to immediately remove the placenta. As the patient was not infected, the abdominal drainage tube might have been omitted.

DISCUSSION

DR. EDWARD A. SCHUMANN said the most interesting problem connected with these cases lies in the position of the placenta. He still felt doubtful, however, about leaving so large a mass of tissue in the abdomen, for fear of infection. Within the past three years he has so left the placenta, cutting the cord close to it. Careful bimanual examination some eighteen months after the operation failed to reveal any evidence of foreign tissue in the abdomen.

DR. BARTON C. HIRST felt there was a very serious risk of separation of the placenta, and fatal hemorrhage can ensue within a few hours after closure of the abdominal cavity.

DR. NEWLIN F. PAXSON said that he had a case at Hahnemann Hospital of a girl whose last menstrual period was in November, and who had an abdominal abortion in December. She came into the hospital in June, about five or six months' pregnant. There was some doubt as to whether she might have had a secondary abdominal pregnancy.

The baby died in the thirty-first week of pregnancy. She was operated upon a week later, the baby removed and the placenta separated. After a stormy convalescence she eventually recovered, after passing a large mass of placenta through the abdominal wound.

DR. BOYD (closing).—It was surprising to find in both cases so little discomfort up until the onset of spurious labor, and it is usually justifiable in the interest of the child to let the pregnancy advance to the thirty-eighth week of gestation.

Diagnosis would seem to be comparatively easy in such cases but is often confounded with fibroid of the uterus and cornual pregnancy. In my second case the fetus was in a normal position and the head well into the pelvis. It was the high position of the cervix above the pelvic brim that directed our attention to extrauterine pregnancy.

DR. MAX TRUMPER (by invitation) presented a paper entitled **Fundamental Biochemical Factors in Pregnancy**. (For original article see page 209.)

DISCUSSION

DR. J. STUART LAWRENCE agreed with Titus that there is a relative and also an absolute hypoglycemia in eclampsia, which Dr. Laferty, of Philadelphia, had been able to confirm by following closely Titus' technic. Failure to read the blood at frequent intervals may be one cause of the differences in the findings of Stander from those of Titus. However another feature was that even in their routine clinic examinations they, Lawrence and Laferty, always found a hypoglycemia in the severe stage of the hepatic type of toxemia and of eclampsia.

DR. DANIEL LONGAKER said that he has tested out calcium gluconate intravenously. The results of its use are very marked, almost spectacular. The benefits, especially in early toxemia of pregnancy, are prompt and pronounced, and the same is true in the later period.

However, in private practice there is comparatively little opportunity to see the ultimate results of toxemia; it has become rare for a private patient to develop eclampsia.

Calcium gluconate he believed filled definite indications and produced beneficial results throughout the entire period of pregnancy. This conviction was based on a large number of observations recently made.

DR. TRUMPER (closing) said that in the face of such positive findings with regard to both hypoglycemia and hyperglycemia in eclampsia, some attempt should be made to reconcile the opposing views of the two schools of investigators. In connection with studies of this nature the condition of carbohydrate stores in the body must always be taken into consideration. This fact has been recognized by most observers but difficulties arise in the study of patients with eclampsia because of the practical impossibility of adequately controlling the nutrition of these individuals for the several days prior to their admission to hospitals in active eclamptic states. It is a known physiologic fact that in the presence of an adequate glycogen reserve in the liver certain factors such as severe exercise, convulsive seizures, acidosis, severe emotion, and certain toxic states may result in hyperglycemia due to increased hepatic glycogenolysis. Any factor which produces hyperglycemia by increasing glycogenolysis in the liver will eventually produce hypoglycemia if the glycogen reserve of the liver is not restored. Therefore it may be understood how the blood sugar findings in a condition such as eclampsia may show marked variations depending upon the supply of glycogen in the liver at the time the patient is first seen and upon the ease with which this glycogen reserve may be maintained during the course of the disease.

Dr. Longaker's mention of the satisfactory results obtained by the use of calcium gluconate in the early toxemias of pregnancy is in accord with the results obtained by Minot and Cutler previously mentioned.

DR. LEONARD AVERETT read a paper on the **Advantages of Kerr Cervical Cesarean Section**, in which he described his personal experience with this procedure in a series of eighteen cases, six of which were doubtful as to possible infection.

In the clean cases are included only those in which all examinations were made in the hospital. Of these, 6 were elective cesarean sections. Six had a test of labor varying from six to twenty hours and all examinations were made per rectum. In 3 cases the membranes had been ruptured from four to eighteen hours before operation.

Of the six doubtful cases two patients had unsuccessful application of forceps, one at home and one at the hospital. One case was a transverse position with a prolapsed hand in an old primipara with a moderately contracted pelvis. The membranes had been ruptured for nine hours, and numerous vaginal examinations were made in the patient's home by the family physician.

Another patient with a contracted pelvis was in labor for twenty-eight hours at home, membranes ruptured for sixteen hours, and had a temperature of 101° F. upon admission to the hospital. An ovarian cyst prolapsed into the culdesac made operative interference necessary. While the patient was in labor at home for many hours repeated vaginal examinations were made. A large baby in a forty-two year old primipara with a rigid cervix in labor at home for 24 hours was another one of this series. The operations were performed under spinal anesthesia in most of the cases. The convalescence in the elective cases was very smooth and in some, differed very little from a convalescence in a normal spontaneous delivery.

DISCUSSION

DR. JOHN A. McGLINN said that he did not see any particular benefit in this operation because there was so much danger of extension of the longitudinal incision. Certainly in any case of low cervical operation, whether it is a transverse or a longitudinal incision, hemorrhage is bound to occur.

There is no doubt at all, he added, that spinal anesthesia greatly facilitates the operation. He anesthetized all his patients in the upright position because he does not use the Pitkin technic. His patients have been entirely free from headache.

Dr. McGlinn said that they have also added music to the operating room routine, where patients are being done under a spinal anesthetic, and that he had found it a great advantage. He said his experience was that the music not only helps the patients, but also the workers in the theater. He said it acted as a shock absorber, and that though it might sound trivial, he had found it to be of definite psychologic benefit.

DR. EDWARD A. SCHUMANN said that the most alarming hemorrhage he had seen was in a case done under a local anesthetic. He said he had had two accidents: one where the lower uterine segment had not been sufficiently distended, with furious hemorrhage; the other was the case of a woman who had been in labor many hours and the lower uterine segment had been so thinned out that hemorrhage was inevitable. In both cases, however, the bleeding was controlled.

DR. AVERETT (closing) said that he found no disadvantage in doing this operation in elective cesarean sections where there has been no test of labor and the lower uterine segment has not been thinned out, the reason being that the space required for the incision is in the transverse and not in the longitudinal diameter.

As to the danger of cutting into the uterine arteries, this can be obviated by making a curved incision with the convexity toward the bladder, thereby avoiding injury to the uterine vessel.

In the case referred to by Dr. Hirst, he found unusually large veins running across the lower uterine segment. Had the transverse incision been made he would have cut across these veins and produced severe bleeding. With the possibility of such a complication in mind, he used the longitudinal incision and had no abnormal amount of bleeding.

Spinal anesthesia was used and crystals of novocain were dissolved in the spinal fluid. This was given with the patient sitting up and immediately after the injection the patient was placed in the Trendelenburg position. He had used this form of anesthesia in three to four hundred cases for gynecologic and upper abdominal operations. The results have been up to the present time uniformly good and without complications such as paralysis, headaches, etc.

DR. DANIEL LONGAKER said that he felt, that Dr. Averett had departed from one fundamental point in the technic of spinal anesthesia as advocated by Pitkin, and that was in not making the injection with the patient in the recumbent position, the head lowered.

He said that he and his colleague, in some twelve recent sections, invariably placed the patient in the horizontal position, with the head slightly lower than the body. Both he and Dr. Harriman felt convinced there was an added element of safety in this precaution, although it is frequently more difficult to enter the spinal canal when the patient is lying down.

While the previous speaker (Dr. Hirst) was uttering his word of warning, Dr. Longaker said it occurred to him to ask whether his work is done under a general anesthetic or under spinal anesthesia. The absolute relaxation of the abdominal muscles is one of the most important facts noticed in operating under spinal anesthesia, and it makes the low transverse cervical cesarean comparatively easy. Moreover the absence of gas pains, vomiting and distension, as well as the fact that one can give orange juice and fluids almost immediately afterwards is a distinct advantage.

The low transverse cervical cesarean section under spinal anesthesia is satisfactory and the operation relatively safe, especially in toxic cases where there is a certain degree of hypertension, elevation of blood pressure, and comparative bloodlessness of the field.

According to his experience one need not wait for the lower zone to thin out before doing the Kerr operation.

DR. BARTON C. HIRST said he saw this operation performed in Glasgow in 1926, before it was published and he had done the first one in Philadelphia. He felt it was a good operation under certain circumstances, but that it should not be used routinely, because he thought there were more cases of hemorrhage in this method than in any other, very alarming hemorrhage, sometimes. It was essential that the operator should always be provided with instruments that would control such hemorrhage. It is not, he said, an operation which should be performed before labor has begun.

BROOKLYN GYNECOLOGICAL SOCIETY

MEETING OF MARCH 7, 1930

DR. BRUCE HARRIS reported a case of **Tuberculosis of the Cervix**. (For original article see page 249.)

DISCUSSION

DR. GORDON GIBSON.—I want to confess that when this patient came into the service I did not know she had tuberculosis, and I think if I saw another case just like it I would not know she had it.

However, there is one thing in this case that we should have thought of. This woman did not look very well; she was rather below par, and did have evidence of an old pulmonary lesion.

DR. SAMUEL A. WOLFE.—In reporting on this slide which was sent to the laboratory, the question arose as to whether we were dealing, in the first place, with tuberculosis or with another type of granuloma, possibly chancre, and the second question that arose was: Is this primary tuberculosis in the cervix or secondary to the more usual tuberculosis of the tubes? From the pathologic standpoint, we feel justified in excluding syphilitic infection for the following reasons:

In the first place, the multiplicity of the lesions; that is, in chancre there is a solitary lesion. In this particular cervix there were multiple foci of granulomas. The granuloma itself was different, being comprised of large epithelioid cells and, as the slides very well show, giant cells. The plasma cell, which is so frequent in chancre, and the perivascular infiltration, which is commonly found in chancre, was missing in this particular slide; so, without subjecting the tissue to specific stain by the Levaditi method, we, nevertheless, felt certain that we were dealing with a tuberculous granuloma and not a chancre.

The unusual point in this case is the primary site in the cervix.

Incidentally, in the last six years I have encountered but four cases of tuberculosis of the uterus; three were instances of tuberculous endometritis and metritis secondary to tuberculosis of the tubes. This is the only instance of seemingly primary tuberculosis of the cervix. After the hysterectomy was performed in this case we made a very careful and painstaking search, making multiple sections through the tubes, ovaries, and body of the uterus to exclude tuberculosis higher in the pelvic viscera. This, I feel, has been satisfactorily excluded, and I think this case may be authentically recorded in the literature as a primary instance of tuberculosis of the cervix.

DR. JAMES W. DUNCAN, MONTREAL, QUE., read a paper (by invitation) entitled **The "Radical" in Obstetrics**. (For original article see page 225.) The discussion was participated in by Drs. Humpstone, Bishop and Kosmak.

DR. HENRY B. BOLEY reported a case of **Purpura Hemorrhagica Complicating the Puerperium**. (For original article see page 252.)

Correspondence

To the Editor.—For the past year I have employed a satisfactory and what I believe to be a new procedure for assisting the completion of the third stage of labor in a physiologic manner.

I wish to present a description of this method as well as my reasons for adopting it.

Normally the placenta separates from its uterine attachment during the pain or uterine contraction completing the second stage of labor. If the delivery of the baby is completed without a pain as by forceps or extraction, then the first after-pain influences the separation of the placenta from its attachment.

Langhans in 1875 showed that a well-developed zona spongiosa is a necessary foundation for a normal placental separation. With a diminution or absence of the spongy layer, a pathologic anchoring of the villi in the uterine musculature begins. This has been shown in many cases reported in the literature.

With the firm contraction of the uterus, as the fetus is expelled, the following occurs: the muscular wall of the uterus becomes thick and hard, the compact layer of the placenta is squeezed free of blood (that in the fetal vessels enters the body of the baby while the blood in the maternal sinuses of the placenta empties into the zona spongiosa). This spongy layer, distended with blood is compressed as in a vise, between the hard contracted uterine muscle and the firm compacta of the placenta, causing rupture of the fine fibrillae of the spongiosa. The placenta therefore separates completely and not in parts. Where the placenta is very thin and extensive this does not take place, and it is frequently found that such placenta remains adherent to the uterine wall.

I do not believe as is generally assumed that placental separation takes place as the result of a retroplacental hematoma although bleeding occurs and accumulates behind the separated placenta. As the maternal surface of the now separated placenta cannot accommodate itself to the diminished uterine surface the placenta folds or "doubles" on itself and lies just above the contraction ring. It is not expelled from the upper contracting part of the uterus as yet because it is held by the firm adhesion of the membranes around the placental border. The uterus has now accomplished all that its muscular contraction, acting on the placenta alone, can do. With the formation of a retroplacental hematoma, further contractions of the uterus acting on this clotted blood as a driving wedge, force the separated placenta downward into the lower uterine segment, peeling the membranes off the uterine wall. As this hydraulic action continues the placenta is expelled into the vagina. If this mechanism fails as is evidenced by external bleeding from the placental site coming from between membranes and uterine wall, there is delay in the downward passage of the placenta.

Manipulation of the uterus during the third stage frequently interferes with this normal mechanism.

To aid in the conduct of this period of labor, I have managed my cases as follows: Following the birth of the child, the "hands off" dictum of Ahlfeld is strictly adhered to. The baby is attended and the cord is cut, cord dressing applied and the perineum inspected. These procedures are done slowly so that five minutes are allowed to elapse following the birth of the baby before any further interference is practiced. Of course, during this time one observes the size of the uterus, the amount of blood lost and the appearance and pulse of the patient. An

Ochsner forceps is now placed transversely on the cord close to the vulva. Holding this clamp in one hand, the other hand is placed on the abdomen above the symphysis. (The radial border of the hand is directed toward the mother's spine while the palmar surface is directed upward toward the diaphragm.) The body of the uterus now lies in the palm of the hand.

Intermittent pressure is made upward on the body of the uterus still holding the clamp at the vulva. As these "pushes" on the uterus are made, the uterus rises higher and higher in the abdomen and the placenta glides into the lower segment and upper vagina. As this is occurring one feels (with the abdominally placed hand) the peeling of the membranes from the uterine wall. The "pushes" must be made with gentleness. If the contraction ring is firm or the placenta has not separated, then the upward push on the uterus will pull upward on the clamp in the other hand. When this occurs no further attempts should be made for five minutes when the maneuver is again repeated. There must be no traction on the cord but it must be held taut.

When the uterus is high up in the abdomen, the assistant or nurse places her hand in the same position on the abdomen holding the uterus high. Gentle downward pressure above the symphysis now expels the placenta from the vagina.

The uterus is held up for fifteen minutes as a prophylactic measure against the occurrence of hemorrhage.

I have conducted two hundred labors in the above manner and have found that there is very little blood lost during the third stage. The retroplacental hematoma is usually absent or may be small in volume.

The upward held uterus contracts firmly because the uterine muscle is anemic, due to the tension on the uterine vessels. There has been no severe loss of blood in any of these cases.

This maneuver is of great value in the treatment of postpartum hemorrhage due to atony of the uterus. The bleeding can be almost instantly controlled by pushing the uterus upward out of the pelvis almost into midabdomen. The tension on the uterine vessels and the avoidance of passive congestion that is usually produced by the Credé maneuver or downward pressure, allow the atonic uterus to regain its tone and contract. This procedure alone may suffice to control the hemorrhage but other measures should also be used.

In patients delivered under deep anesthesia by forceps or extraction, one must wait for the first after-pain to effect separation of the placenta before performing this mode of delivery. This usually takes from ten to fifteen minutes. The success of the procedure depends upon the placenta being separated; hence it must fail in placenta accreta and adherent placenta.

There have been no untoward results from the use of this plan of treatment.

I desire to place my observations on record and intend at a later time to present a more detailed account of the procedure and a more thorough discussion of the physiology involved.

MURRAY L. BRANDT, M.D.

2021 GRAND CONCOURSE, NEW YORK.

American Journal of Obstetrics and Gynecology

GEORGE W. KOSMAK, M.D., EDITOR

HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Editorial Comments

Protection Against Possible Abuse of the Aschheim-Zondek Pregnancy Test

PATIENTS and physicians readily appreciate one feature of the Aschheim-Zondek test, namely, that it belongs to that unfortunately small group of tests which in their execution inflict upon the patient not the slightest pain, discomfort, or even inconvenience. All she has to do is to send a specimen of morning urine to the laboratory. And now we are told by Stern in a recent number of the *Zentralblatt fuer Gynaekologie* that this very feature of the test renders it particularly useful for spying, deception, fraud, and other like procedures practiced with dishonest intent. Some one might surreptitiously get hold of such a tale-telling bit of urine and find out many things he ought not to know. A suspicious husband could secure proof positive of the faithlessness of his wife. Parents could keep careful watch over the daughter leading the gay life of the day. The lady of the house, insisting upon perfect morality, could keep track of the doings of her servants. How simple for the roommate to find out whether her girl friend is in trouble. The young man of town could keep track of his lady love—to break quickly with her in case the outcome of the test would not be to his liking. The cunning and informed sweetheart could procure some urine from a less fortunate girl friend and thus hasten a marriage of which she feels not any too certain. And the other way around, substitution of urine from a nonpregnant woman would be an easy means of dissimulating an existing pregnancy, and then quickly another lover could be procured financially better equipped to pay alimony.

These examples of possible abuse might suffice, and with satisfaction we acknowledge that Stern has not so far met with any of them in reality. With the same systematic thoroughness he elaborates the

measures required for full protection against such possible deception: (1) Urine must be obtained directly from the patient only by means of catheterization; (2) the test should be made only by physicians; (3) the test is made only when demanded by the patient; (4) the result of the test is communicated only to the patient.

We beg to assert that even these precautions would still leave ample opportunity for deceiving husband or lover on the basis of the Aschheim-Zondek test.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Selected Abstracts

Carcinoma

Kanki, Y.: Statistics of Uterine Cancer. Japanese J. Obst. & Gynec. 12: 12, 1929.

The author could not prove any relationship between the number of labors and cancer of the cervix uteri. The latter was found to be most frequent between the ages of thirty and sixty and the average age was forty-four and one-half years. The spinal cell type was found among the younger women whereas the fat spindle cell type was prevalent among the older ones. The spinal cell type frequently attacked the lymphatic glands but only rarely affected the connective tissue (parametrium). On the other hand, the fat spindle cell type acted in the reverse way. Recurrences were more frequent with the spindle cell type.

J. P. GREENHILL.

Hoffman, F. L.: Cancer in Hawaii. Address delivered before the Pan-Pacific Surgical Congress, Honolulu, Aug. 17, 1929.

Cancer in Hawaii during the last five years has shown no pronounced tendency to increase. The cancer death rate in Hawaii is measurably below the average for most other civilized countries or localities. The most important form of cancer is that of the stomach and liver. Cancer of the female genital organs and the breast appears not to be excessively common among any of the various racial elements. There was no cancer of the breast among Japanese women which is in strict conformity with the rarity of this form of disease in Japan. Among the women in the Hawaiian Islands the outstanding form of cancer is that of the uterus, there having been 128 deaths from this form of the disease out of a total of 364. Cancer of the breast caused only 22 deaths out of the 364 deaths.

J. P. GREENHILL.

Horwitz, Alec: Incidence of Carcinoma of the Uterus Among Jewish Women. Surg. Gynec. Obst. 44: 355, 1927.

Racial immunity to carcinoma, the ritual dietary laws, poverty, and the more normal blood supply to the generative organs in Jewish women, have been some of the reasons advanced to explain the relative infrequency of carcinoma of the uterus in Jewish women. These, and many other reasons, however, have been refuted by other authorities; the fact still remains that in spite of the fertility and longevity of Jewish women, carcinoma of the uterus is relatively infrequent among them.

Of 1,237 cases of primary carcinoma of the uterus seen at the Mayo clinic between 1920 and 1925, inclusive, 1,227 were among gentiles and 10 were among Jewesses. Ninety-seven per cent of the 1,237 patients were married.

From data obtained at the Curie Hospital, where two-thirds of the patients were treated for carcinoma by roentgen rays or radium, the incidence of carcinoma was slightly less for the Jewish patients (62 per cent) as compared with carcinoma in the gentiles (66 per cent).

Carcinoma of the uterus is comparatively infrequent among Jewesses, being about one-fourth as frequent as in the gentile women (3.9 per cent as compared with 16.5 per cent).

Carcinoma of the breast in the female is common among Jewesses and almost equals the percentage in gentile women, the incidence being 26.4 per cent and 28.3 per cent, respectively.

Carcinoma of the digestive tract, including the liver and pancreas, was almost twice as frequent in the Jew as in the gentile, being 30.2 per cent and 17.1 per cent, respectively.

WM. C. HENSKE.

Wistein, R.: The Cancer Problem. Med. Woman's J. 26: 201, 1929.

This is a review of the literature on cancer, including theories as to etiology, diagnosis, and treatment. Under the latter head the author takes up in detail treatment with emetin hydrochloride, stating: (1) Emetin will cure early carcinoma. (2) It will prevent the return in operable cases if used in connection with surgical treatment. (3) It will widen the field for operable cases by making inoperable, operable. (4) It will relieve the pain and odor in the last stages of advanced cases.

FRANK SPIELMAN.

Schiffman, J.: Causes and Treatment of Postclimacteric Bleeding. Wien. klin. Wehnschr. 42: 53, 1929.

In discussing the causes of postmenopausal bleeding the author includes "kolpodystrophia postclimacterica desquamativa" (which he believes is a better term than "kolpitis vetullarum"), vaginal carcinoma, cervical and fundal polyps, and carcinoma of portio, uterus and ovaries. He emphasizes that in cases where no cause for bleeding can be found in spite of curettage, an ovarian carcinoma, which may produce only transient bleeding, be looked for.

In treatment he prefers operation plus x-ray for carcinoma of both cervix and fundus whenever possible. He deplors the tendency to perform hysterectomy without diagnostic curettage where no cause for bleeding is found, and advises that if operation in these cases is decided upon, the adnexa also be extirpated. In cases where careful study has produced no evidence of abnormality, he recommends observation especially for the presence of ovarian carcinoma.

FRANK SPIELMAN.

Oki, Tsunemitsu: On the Relation of Glycogen and Carcinoma of Cervix of Uterus. Japan Med. World 7: 108, 1927.

The author has analyzed the cases coming to the gynecologic clinic at Aichi Medical College from August, 1922, to May, 1927. His classification of cervical tumors with percentage of each is as follows:

1. Primary solid carcinoma - - - - - 95 per cent (Total)
 - (a) Ripe carcinoma - - - - - 7.4 per cent
 - (b) Medium ripe carcinoma - - - - - 52.6 per cent
 - (c) Unripe carcinoma - - - - - 40.0 per cent
2. Primary glandular carcinoma - - - 5 per cent (Total)
 - (a) Glandular carcinoma - - - - - 60 per cent
 - (b) Malignant adenoma - - - - - 40 per cent
3. Mixed form.

Glycogen was found in 60.6 per cent of the solid carcinoma and in 20 per cent of the glandular type. Glycogen was also found in the leucocytes about the tumors. The author quotes the statistics of numerous other writers, some maintaining that the glycogen appears in cells that are growing and others claiming that the substance is found only in cells that are losing metabolic activity. The author shows that in his cases he has found that it appears in cells which are losing their metabolic activity or have no activity and yet are not atrophic. He has noticed an increase in glycogen in tumors treated with radium. He concludes that glycogen is due to a disturbance of sugar metabolism caused not only by circulatory disturbances but also by physiochemical influence (as radium).

GENE M. KASPER.

Lahm: *The Glycogen Content of Uterine Cancer.* *Ztschr. f. Geburtsh. u. Gynäk.* 93: 356, 1928.

Glycogen has been found in carcinomas of the skin and mucous membranes but not in those of the breast, large intestine, ovary, and most adenomas. It is demonstrated in the cells of the tumor by using Best's stain.

The author investigated 20 cases of cancer of the cervix, one of the fundus, and four normal cervixes by staining sections for glycogen.

Thirteen cases of cancer of the cervix were of the ripe type, i.e., differentiated, and eleven of these contained glycogen in large amount. Those which were unripe contained little or none. The sections showing normal epithelium contained glycogen when the cells were well differentiated but where they were growing over an erosion and were therefore young, less ripe cells, glycogen was not found.

The squamous epithelium of the vagina and cervix of the mature female always contains glycogen. It is not known whether this changes with the menopause. It is certain that the amount of glycogen decreases when the change to carcinoma occurs. There may be some relation to the ovarian hormone but a case examined before and after ablation of the ovaries has not been obtained.

Adenocarcinoma of the fundus and cervix does not contain glycogen unless epithelial pearls are formed and these do contain it.

This study may help in the diagnosis between precancerous and true carcinoma of the cervix.

FRANK A. PEMBERTON.

Guthman, H., and Hess, L.: *Antitryptic Index In Carcinoma.* *Arch. f. Gynäk.* 131: 463, 1928.

The antitryptic content of the blood serum in carcinomatous patients varies but averages higher than in normal healthy patients. Immediately following radiation therapy there is a definite increase in this antitryptic index. This gradually returns to its former normal value. The authors conclude that the test has no prognostic value.

RALPH A. REIS.

Novak, Emil: *The Recognition of Early Cervical Cancer.* *Surg. Gynec. Obst.* 50: 200, 1930.

The early diagnosis is often difficult, but it means much to the patient, as it gives her a relatively good chance for life. It requires experience, a careful pelvic examination, including the use of the speculum in a good light and in a certain proportion of cases, biopsy and microscopic examination. Biopsy is indicated if there is an indurated area on either cervical lip, especially if the overlying surface is granular, vegetative, or ulcerated and very vascular. It is also indicated if in an erosion or

ectropion there is a hardened or raised area, with vascularity, sponginess, or tendency to ulceration of the surface.

Biopsy may be performed with a sharp knife or punch followed by searing of the wound edges with the cautery. The tissue should be excised from the most suspicious area, and the sections should be cut in such a manner as to show the mucous surface. It is desirable to cut a number of sections at different levels in the block.

The pathologic examination should be made by a competent pathologist, preferably by one thoroughly familiar with the special pictures encountered in this field. In a small residuum of cases the diagnosis may be impossible. In such cases the proper procedure is to wait for a few weeks and then repeat the procedure.

The great majority of cervical lesions is obviously benign so that biopsy and microscopic differentiation need be invoked in only a small proportion. If the pars vaginalis is normal in appearance but the intracervical mucosa seems vascular or granular, the curette may reveal definite intracervical cancer, most often adenocarcinoma.

If, as is most often the case, the suspicious lesion is found to be benign, it should be eradicated by whatever method is best suited to the individual case. Usually some simple procedure often of the office type is sufficient. These lesions unquestionably predispose to cancer, when combined with the still unknown factor of individual susceptibility. Their eradication is the one important contribution we can make to the direct prophylaxis of cervical cancer.

WM. C. HENSKE.

Victor-Pauchet: A Danger of Biopsy in Cancer of the Fundus: Uterine Perforation. *Bull. et mém. Soc. des chir. de Paris* 14: 726, 1928.

The author reports the case of a woman sixty years of age in which the fundus was perforated during a diagnostic curettage. The perforation healed spontaneously. One year later the patient consulted the author because of pain in the abdomen. Laparotomy showed a somewhat enlarged uterus on the superior surface of which was a newgrowth. A loop of intestine had been surrounded by the newgrowth. A complete hysterectomy and resection of the adherent bowel were carried out. Six months later the patient presented a metastasis of the large omentum in the region of the epigastrium. Gross and histologic diagnosis was cancer of the uterine fundus.

In discussing the case Victor-Pauchet points out that in suspicious cases of uterine bleeding where the cervix is negative the fundus should be suspected. In these cases he is opposed to biopsy relying on the clinical manifestations for a diagnosis. Biopsy by curettage is dangerous both because of the danger of perforation and because cases have been reported where a negative biopsy report was followed in one to two years by death from fundal malignancy. Therefore in all cases of bleeding in patients past the menopause and in which the cervix is negative, a hysterectomy, either abdominal or vaginal, should be immediately resorted to. Should an infected or cancerous uterus be perforated by curettage a hysterectomy should be done immediately; on the other hand perforation of a benign uterus is not dangerous.

THEODORE W. ADAMS.

Léo: Biopsy in Cancer of the Fundus. *Bull. et mém. Soc. des chir. de Paris* 15: 768, 1928.

Léo agrees with Victor-Pauchet that when the clinical symptoms of fundal carcinoma are sufficiently clear, a hysterectomy should be done without diagnostic curettage. On the other hand he stresses that fragments of all curettages should be sent to the pathologist for a microscopic examination. Care should be used in doing a curettage so that the entire uterine cavity is thoroughly covered.

THEODORE W. ADAMS.

Bailey, K. V.: *An Inquiry Into the Basic Cause and Nature of Cervical Cancer.* Surg. Gynec. Obst. 50: 513, 1930.

The various aspects of erosion in all its phases and degrees, its associated cellular activities, and its histologic eccentricities are thoroughly described in this paper. The ultimate sequel to erosion is malignancy, but there is the phase between these two which must be bridged, the premalignant phase which must contain the primary malignant reactions. This study has aimed at the recognition beyond doubt of these earliest manifestations of cancerous change, in the hope that some light may thereby be thrown upon the origin of this disease.

WM. C. HENSKE.

Graves: *Relationship of Imperfect Drainage to Genital Cancer in the Female.* Am. J. Surg. 3: 489, 1927.

Graves cites five cases of cancer occurring in women who had atresia somewhere along the genital tract. He claims the retained secretions are a causative factor because of their irritating effect. The advisability of exercising more care to avoid stricture in plastic operations and a closer observation of the postclimacteric patient is emphasized by Graves.

WILLIAM KERWIN.

Blind, Auguste: *Mucous Polyps and Uterine Cancer.* Bruxelles Med. 10: 322, 1928.

The author reports two cases of polyps of the cervix which on microscopic examination were shown to be of the simple mucosal variety. In both cases the patients, a few months later, developed carcinoma of the fundus. He, therefore, feels that the appearance of simple polyps in women past the menopause probably is secondary to other pelvic pathology and should suggest a possible malignancy of the uterus.

THEODORE W. ADAMS.

Condamin, R.: *Cancer of the Cervix in a Pregnant Uterus.* Gynec. 27: 577, 1928.

The author reports 4 cases of cancer of the cervix complicating pregnancy. He believes that a pregnant uterus tolerates very well the usual dose of radium but it is advisable to keep the patient under the influence of morphine in order to help this tolerance. In two of the author's cases, labor took place through the natural passages, but these cases are exceptional and require careful watching. The usual method of delivery should be by cesarean section. The author maintains that the fetus is not affected by radium even if applied in the early weeks of gestation. He believes that when radium is applied in the sixth or seventh month, it is best to perform a hysterectomy after the child is delivered. On the other hand, when radium is administered early and repeatedly, another application after delivery is preferable. Treatment should be instituted early in every case without considering it dangerous for the child.

J. P. GREENHILL.

Miller: *Prophylaxis of Cancer with Special Reference to the Cervix Uteri.* New Orleans M. & S. J. 80: 253, 1928.

Schereschewsky, in the United States Public Health reports for 1926, states that one patient dies of cancer every four minutes, and that between the ages of forty-five and sixty-five, one out of every five women succumbs to this disease. For this reason Miller feels that too much cannot be said as to the prevention of cancer. By far the majority of cancers in women originate in the cervix uteri. This organ is

readily accessible to examination, and the forerunners of cervical malignancy (laceration or eroded cervix) may therefore be found and corrected. A vaginal discharge is not a normal condition and cases with this manifestation should be subjected to thorough examination with biopsy and microscopic examination of the removed tissue. In this way alone can uterine malignancy be discovered in the curable stage. It is the responsibility of the medical profession not only to conduct such examinations but to disseminate the knowledge of their necessity among the laity.

THEODORE W. ADAMS.

Jeanneney, G.: Cancer of the Cervical Stump After Subtotal Hysterectomy. *Rev. franç. de gynéc. et d'obst.* 24: 273, 1929.

The author emphasizes that every cancer found in a cervix after subtotal hysterectomy does not constitute a case of cancer of the cervical stump. In many cases cancer or latent cancer was present at the time the body of the uterus was removed. An interval of time, preferably at least a year or two, should elapse between the operation and the finding of cancer in the cervical stump to make a case authentic. At the cancer center of Bordeaux and the South West among approximately 1800 cancers of the cervix seen from 1925 to 1929 there were nine cancers of the cervical stump. The author believes that this type of cancer is no more frequent than cancer of the cervix in women not operated upon, hence subtotal hysterectomy does not predispose the cervix to cancer.

In 90 per cent of the cases reported in the literature the body of the uterus had been removed because of fibroids. The incidence of this type of cancer decreases as the length of time the operations was performed increases. The prognosis of this type of malignancy is very grave. The literature indicates that more than 50 per cent of the patients died in spite of operation and radiation therapy. The only prophylaxis is to perform a total hysterectomy routinely but this is not necessary except in simple cases in which there are cervical lesions, in syphilitic patients and in those with fibroids. In all other cases, a subtotal hysterectomy is sufficient.

The treatment of cancer of the cervical stump in early cases is by abdominal operation, for by this means, not only may the cervix be removed but also the broad ligaments. When resection is attempted vaginally, there is difficulty in removing the entire cervix because it is friable. Great care must be exercised in applying radium in the cervical canal because of the possible proximity of intestinal loops. The safest thing to do is to systematically examine all patients who have had operations and to institute treatment as soon as any sign of cancer is observed.

J. P. GREENHILL.

Lovegren: Carcinoma of the Vagina in Second Year of Life. *Trans. Finnish Med. Soc.* 71: 717, 1929.

The writer records a vaginal carcinoma in a girl seventeen months old, representing an extremely rare observation. A drop of blood appearing in voided urine of a seemingly healthy infant furnished the first symptom.

When first seen child was well nourished, urinary findings negative. Through an ear speculum introduced into vagina a dark red, irregular thickening was seen on the right posterior wall covered by a dirty looking membrane. A tumor in vaginal wall was palpated through rectum, the uterus lying clearly separated from it. Microscopic study of tissue removed revealed a malignant, papillary, epithelial mass.

Disease progressed rapidly. Cachexia, loss of weight, anemia and fever soon appeared. Radical surgery was refused by the parents, and application of radium resulted in temporary remission of symptoms. Tumor increased, foul, bloody discharge and metastases developed in abdominal wall and right lumbar region. Death occurred six months after first symptoms.

REUBEN L. LARSEN.

Pettit, R. T.: *Intravenous Lead in Treatment of Cancer*. Illinois M. J. 55: 9, 1929.

The use of intravenous lead in treatment of cancer is founded on a very substantial theoretical basis which is now supported by a mass of scientific data worked out by the Liverpool Cancer Research Organization.

The similarity between chorionic epithelial cells and carcinoma cells, and the susceptibility of the former to lead, suggested to Bell that cancer cells also might be susceptible to the effects of lead if administered in sufficient amounts.

At first metallic lead, in a finely divided state, was used intravenously in several advanced cases with some very striking results.

Routine complete examinations of blood and urine in fit patients are necessary before undertaking the treatment. In the course of this treatment, blood films are examined regularly for stippled cells and if one per field is present, treatment is usually suspended. The most important contraindications to treatment are (a) myocarditis, (b) hypertension, (c) renal impairment, (d) anemia, hemoglobin less than 50 per cent or red cells less than 3,000,000.

The preparation of lead most consistently effective is a fresh metallic suspension in gelatin. The first two doses are usually 75 mg. and then the amount is reduced to 50 mg. for the next two doses and then 25 mg. for each of the succeeding doses until 500 mg. is given. The interval between injections is usually seven to ten days but the chief guide to dosage and interval is blood examination.

The reaction to the treatment is variable, local or general or both. Usually the patient complains of pain at site of the tumor within a few hours after injection and this pain may be accompanied by swelling and edema. The general reaction affects the blood and blood forming organs with the production of anemia and stippling and there may be more or less disturbance of the gastrointestinal tract, liver, and kidney (albuminuria) and suspension of urinary output. Blue lines on the gums are rare.

Results of treatment are not startling except in isolated cases. In 227 cases treated, the percentage of success is about 20 per cent.

ADAIR-GILMAN.

Mikulicz-Radecki: *Therapy of Uterine Carcinoma*. Deutsche med. Wchnschr. 55: 2000, 1929.

Radiotherapy and radical surgery as therapeutic procedures for carcinoma of the cervix have been thoroughly tried out in the different German clinics and have yielded about the same result. The author believes that either technic has been developed to perfection and that further improvement of results at present will only be accomplished by a systematic combination of both therapies. In the University-Clinic of Leipsic a therapeutic plan has been adopted consisting of four consecutive steps: (1) preliminary massive radium-treatment, (2) vaginal extirpation of the uterus with subsequent radium-application, (3) postoperative series of x-ray treatment, (4) social and medical supervision for a long time after discharge from the hospital. Of course, there is a considerable number of patients on whom no operation can be performed on account of advanced carcinomatous infiltration. The preliminary radium-treatment, however, improves in some of them the local condition so much, that operation becomes feasible later on.

The carcinoma of the corpus is treated by vaginal extirpation of the uterus and removal of the adnexa. The second step is a postoperative x-ray treatment as done for cervical cancer.

G. E. GRUENFELD.

Weibel, W.: Twenty-Five Years Experience with the Wertheim Operation. Arch. f. Gynäk. 135: 1, 1928.

During the past twenty-five years the author has performed the radical Wertheim operation for carcinoma of the uterus 1500 times, 500 operations in the Bettina Hospital and 1000 in the second Frauenklinik of Vienna. In the entire series the same technic, the original procedure as outlined by Wertheim, was followed. Gradual improvement in results has not been due to improved technic but must be credited to progress in the methods of preoperative preparation, of anesthesia and of postoperative care. Of these 1500 cases, over 1000 have been followed for more than five years. From September 16, 1898, until October 18, 1922, the author saw 3184 patients suffering from carcinoma of the uterus. Of these 1515 were inoperable and 169 were treated by radiation therapy.

Weibel divides the cases into four groups: Beginning carcinoma 6.5 per cent; mild carcinoma 43 per cent; severe carcinoma 36 per cent; and very severe carcinoma 14.5 per cent. In spite of all advances in gynecology and the repeated and persistent attempts at education of the layman, there has been no improvement in either the operability or in the severity of the carcinomas at the time of operation. Patients do not present themselves any earlier for operation now than at any time previous. The operability percentages vary from year to year without any steady improvement, and range from 44 per cent to 63 per cent.

A great deal of the improvement in immediate and remote mortality is due to advance in anesthesia: 454 patients had lumbar anesthesia only, and 320 had lumbar anesthesia combined with inhalation narcosis. Weibel is definitely of the opinion that lumbar anesthesia is not only safer but also better for both the patient and the operator.

Of the postoperative complications, there were 15 per cent with injuries of the bladder, rectum or ureters, and 4 per cent had resections of the bladder, rectum or ureters; 10 per cent developed fistulas, 5 per cent had postoperative pyelitis and practically every patient developed postoperative bladder weakness or infection; 1.7 per cent had thrombosis or thrombophlebitis, 1 per cent embolism, and 12.6 per cent wound infections.

The total primary mortality was 13.8 per cent. There has been steady improvement, however, for in the first 500 operations, the primary mortality was 19 per cent, in the second 500 it was 13 per cent, and in the last 500 it dropped to 9 per cent. In beginning carcinoma the primary mortality was 8.2 per cent, in mild cases 10 per cent, in the severe types 15 per cent and in the very severe 24 per cent. Of the patients who died, 54 per cent died of peritonitis and 7.5 per cent of other infections; 6 per cent died of embolism, 0.5 per cent of ileus, 12 per cent of cardiac failure, 3 per cent of pneumonia, 8 per cent of urinary tract injury, 7 per cent of intestinal injury, 5 per cent of hemorrhage, and 3 per cent of thrombosis.

Five years following operation, 40 per cent of all operated patients were free from recurrences, or 47 per cent of those who survived the operation. Of the patients with definite secondary carcinoma of the abdominal lymph glands, 10 per cent were five year cures. Of the recurrences, 45 per cent occurred within the first year, 26 per cent within the second year, 14 per cent during the third year, 9 per cent in the fourth and 6 per cent in the fifth year.

There were in this series, 26 instances of carcinoma and pregnancy. The results obtained when pregnancy occurred were the same as for the entire group. As to age incidence, 3.5 per cent were under thirty years, and 7.2 per cent were over sixty years. There is no detectable difference in the severity of the malignancy, the operability, or the five year cures between the different decades.

RALPH A. REIS.

Schleyer, E.: The Results of the Operative Treatment of Carcinoma of the Ovary. *Monatsschr. f. Geburtsh. u. Gynäk.* 79: 302, 1928.

The author analyzed all the cases of ovarian carcinoma operated upon in the First Woman's Clinic in Vienna during the years 1910 to 1925. Among 97 cases available for study the primary mortality was 12.4 per cent. Among 39 cases where the malignancy was limited to the ovaries the mortality was 2.6 per cent, whereas among 58 cases where the process had advanced beyond the confines of the ovaries the mortality was 18.9 per cent. In the 52 unilateral cases the death rate was 9.6 per cent and in the 45 bilateral cases it was 15.5 per cent.

The patients were followed up and freedom for five years was taken as the criterion for a cure. Of 57 cases available for analysis only 12 patients or 21 per cent were alive. Of the 115 cases, 102 were primary and of the 13 metastatic cases, 12 were gastrogenous in origin and one originated in the uterus.

The rule in the clinic is that unless there is a definite contraindication, every case of carcinoma of the ovary must be operated upon even if only for purposes of exploration and to make certain of the diagnosis. Both ovaries are removed because of the great frequency of recurrence if the uninvolved ovary is left behind. The uterus is removed in old women and in cases where the ovarian malignancy is metastatic because the uterus in these cases frequently contains metastases. In all other cases the uterus is removed only when there are implantation metastases on it. Rupture of a malignant cystoma during operation is a serious complication as indicated by the fact that among 13 cases where the cyst was ruptured during operation only 15.4 per cent were cured whereas among 19 unruptured cases 36.8 per cent were cured. Ascites was present in 21.7 per cent of the cases and in 83.5 per cent the menses were undisturbed.

The best prognosis is in the cases of carcinomatous degeneration of pseudomucinous cystomas and the worst prognosis in the metastatic carcinomas. Total extirpation gives the best results but cures have followed unilateral oophorectomy.

J. P. GREENHILL.

Kermauner, F.: Treatment of Carcinoma of the Uterus by Abdominal Operation. *Wien. klin. Wchnschr.* 42: 1097, 1929.

This is a report of 976 cases of carcinoma of the uterus seen from 1916 to 1923 inclusive. Of them 352 were inoperable, of which about half were treated with radium or x-ray, and the rest by injections of various substances (with no improvement), or not at all. Of those treated with radium 12 or 6.4 per cent were cured for at least five years, while those treated with x-ray alone showed no cures.

The other 624 cases were operated, representing an operability of 63.9 per cent. Of these 70 or 11.2 per cent died. Five- to twelve-year cures comprise a total of 231 cases, a relative percentage of 40.4. Several of these showed recurrence after seven or eight years, and one after thirteen years. Combined radium and operation cures totaled 258 or 26.95 per cent.

The author concludes that he is not as yet ready to give up operation in favor of radium and x-ray, although he has limited operation somewhat since 1927. He stresses early recognition as being the most important factor in the determination of results.

FRANK SPIELMAN.

Peham, M.: Results with the More Extended Operative Methods in Uterine Malignancy. *Wien. klin. Wchnschr.* 42: 1622, 1929.

Operative results in uterine malignancy for the past 3 decades are compared for the purpose of determining the most efficacious operative method. The figures of Wertheim-Weibel using the more extensive abdominal methods, in their percentages

of primary mortality, and relative and absolute cures are found to be not as satisfactory as those in which the less extensive vaginal methods have been used. Illustrative of the latter are the figures of Stoeckel and the author's who use the vaginal route. The author's figures are especially significant, showing for the years 1921 to 1924 an operability of 59.7 per cent, a primary mortality of 6.9 per cent, a relative cure of 44.7 per cent, and an absolute cure of 28 per cent.

The question of wide lymph gland removal is not as important as it formerly has appeared, especially since the advent of postoperative x-ray therapy. In comparing absence of recurrence after five years, there is found to be an increase of more than 15 per cent in those free of the disease who have had x-ray, over those who have not. Besides x-ray, the difference in primary mortality also makes it advisable to use the less extensive methods.

FRANK SPIELMAN.

Schmidt, H. R.: The Operative Treatment of Operable Carcinoma of the Uterus and its Relation to Radiation Therapy. Med. Klin. 25: 623, 1929.

Since the results in cases of carcinoma of the body of the uterus are the same regardless of whether operation is performed or radium is employed, the latter should be used in technically difficult operable and inoperable cases. In cases of operable cervical cancer, however, the results of operation are not very good and the chief reason for this is the very high operative mortality. According to Heyman the average immediate death rate in 22 clinics is 17.2 per cent. The chief causes of death are cardiac weakness, hemorrhage, pneumonia, and peritonitis. The author has abandoned the preoperative roentgen-ray treatment in cases of cervical carcinoma because this must be given six weeks before operation and during this interval the patient may be lost trace of. The essential thing in securing a permanent cure is repeated radiation treatment after operation. The author employs radium ten days postoperative and repeats this ten days later. In the interval between these two radium treatments, deep x-ray therapy is given. Six months later x-ray treatment is again given. In ten cases so treated the results have been very good. Even in cases of recurrence in the vaginal scar, radium occasionally produces excellent results.

J. P. GREENHILL.

Pal, J.: The Cachexia of Malignancy and Its Control. Wien. klin. Wchnschr. 42: 321, 1929.

The efficacy of the liver treatment of pernicious anemia depends upon the ability of the bone marrow to respond to the stimulating substances found in liver which cause a regeneration of the red blood cells. This is also true in the other anemias including the cachexia of malignancy. Two of these stimulating substances have been isolated. They are amines, histamine and choline, and are found not only in liver, but also in kidney, adrenals, heart muscle, and striped muscle. Given by mouth they have produced a definite improvement in patients with inoperable carcinoma, causing an increase in weight as well as return of appetite. Adrenal extract which has a high choline content is recommended for injection. By mouth the above mentioned organs as well as their extracts can be used. Failures in their use are due to the inability of the bone marrow to respond. The influence that these substances have upon the malignancy itself has not yet been determined.

FRANK SPIELMAN.

Mandl, Felix: Prophylaxis Against Recurrence Following Operations for Malignant Tumors. Wien. klin. Wchnschr. 42: 1269, 1929.

Recurrences following operations for malignant tumors are probably the result of dissemination of malignant cells about the area excised. For this reason the author

advocates whenever possible the use of fulguration, the electric cautery, hot iron, etc. instead of the scalpel.

One of the most important factors is combating the anemia and cachexia present. Arsenic, insulin in 10 to 20 unit per day doses well controlled by carbohydrates, and liver should be used. Prophylactic postoperative x-ray therapy seems to be efficacious only in well localized malignant conditions.

FRANK SPIELMAN.

Wallart, J.: Carcinoma of the Theca Interna of a Lutein Cyst. Arch. f. Gynäk. 135: 485, 1929.

This rare tumor reported by Wallart was a carcinoma of the theca interna of a lutein cyst. The patient was forty-five years old and had a healthy child three years previously. She was operated upon for chronic appendicitis, and laparotomy disclosed a typical carcinoma developing from the theca interna. All gradations of cells were present from the small granulosa cells with dark nuclei to the lighter theca cells. The endocrine elements of the theca interna are probably of the same origin as the granulosa cells which form the greater part of the corpus luteum.

RALPH A. REIS.

Meigs, J. V.: Adenocarcinoma of the Fundus of the Uterus. New Engl. J. Med. 201: 155, 1929.

In 206 cases of body cancer seen in the Huntington Memorial Hospital, vaginal metastases were discovered in 12.1 per cent, proving that this form of metastasation is not by any means uncommon. A vaginal cancer should never be regarded as primary until the uterus has been investigated. The metastases are more likely to form by way of lymphatics or possibly venous channels than through direct implantation. If the vaginal metastases seem treatable, hysterectomy should be performed, otherwise radium is used, on the vaginal metastases preferably in form of gold or glass seeds.

EHRENFEST.

Stacy, Leda J.: Carcinoma of the Fundus of the Uterus. Surg. Gynec. Obst. 49: 43, 1929.

Although carcinoma of the fundus occurs most commonly after the menopause it is fairly common in women less than forty-five years of age, having occurred in 10.51 per cent of the cases in the series reported.

Metrorrhagia was the most common symptom and was the first symptom noted by 63.66 per cent of the patients in this series. Uterine myoma occurs more than three times as often in women with carcinoma of the fundus as in women without such carcinoma. The symptoms might be attributed to the myoma and then cause a delay in making the diagnosis of malignancy. Every patient having metrorrhagia or an abnormal vaginal discharge should be examined thoroughly to determine the cause of symptoms irrespective of age, and if the symptoms warrant it and the patient is not a poor surgical risk, hysterectomy should be done even if malignancy is not found by curettement.

The greatest number of the patients who died following operations for corpus carcinoma died during the first three years of local recurrence. More five-year arrested cases result from operation for carcinoma of the uterine fundus than from operation for carcinoma in other commonly affected organs.

WM. C. HENSKE.

Department of Book Reviews

CONDUCTED BY ROBERT T. FRANK, M.D., NEW YORK

Review of New Books

Kuntz has written a well-planned and readable book on the difficult subject of the *Autonomic Nervous System*.¹ It appears as clear cut and understandable as any description of this difficult and involved subject will allow. He uses Langley's terminology of the autonomic nervous system which covers the entire nerve supply under discussion, with further division into sympathetic and parasympathetic.

The anatomy is taken up with each individual organ discussed. Drug actions are dealt with.

The author concludes that no evidence of enervation of the ovarian follicle or of the interstitial tissue has been demonstrated, nor has any evidence of drug influence on ovarian function by nerves, been proved, although the ovarian vessels, and consequently the ovarian blood supply, is under nervous control. The uterine muscle possesses an inherent capacity to undergo rhythmic contractions. Normally the muscle is subject to both motor and inhibitory nervous control of reflex or central nervous origin.

Among the major subjects dealt with are the pathology, including neoplasms, of the autonomic system. Visceral sensitivity and referred pain are thoroughly discussed. Kuntz agrees in a limited way with the theory of vago- and sympatheticonia of Eppinger and Hess.

He also takes up the autonomic nervous system and its relation to the glands of internal secretion; to internal secretion; to emotion and stress; and effect of infectious diseases and cardiovascular diseases.

The concluding chapter deals with the surgery, including periarterial sympathectomy, ganglionectomy, and ramisection.

The book is an important and useful one.

—R. T. Frank.

The fourth installment of the second volume of the *Handbuch der gesamten Strahlenheilkunde, Biologie, Pathologie und Therapie*² has come to hand. The most important chapter is one dealing with radiotherapy as a means of mass treatment of carcinoma.

Lazarus observes that among civilized people on the one hand, the percentage of births is growing less, so that on the other fewer children are born but fewer die from children's diseases and plagues. As a result of this prolongation of life an increasing ballast of senile masses results. The consequence of this increase in age of the population produces an increased invalid population. In Germany in 86,000 autopsies, 10 per cent were due to death from malignant neoplasms during the years of 1920 and 1921. In England, in ten years, 40,000 women died from uterine cancers, while in Germany, 8,000 die from these yearly.

Solomon contributes a chapter on the roentgen treatment of Basedow disease; Baumeister on the treatment of internal tuberculosis; Milani and Meldolesi on the roentgen treatment of infectious diseases.

¹The Autonomic Nervous System. By A. Kuntz, Ph.D., M.D., Philadelphia. 1930. Lea and Febiger.

²Handbuch der gesamten Strahlenheilkunde, Biologie, Pathologie und Therapie. Zweiter Band, 4. Lieferung. Herausgegeben von Prof. Dr. Paul Lazarus. J. F. Bergmann, München. 1930.

Béclère and Levy discuss the radiotherapeutic treatment of the nervous system which not only includes tumors, but also such diseases as syringomyelia, multiple sclerosis, tabes, and poliomyelitis, as well as peripheral nervous trouble. The concluding chapter is by Czerny and Karger on radiotherapy of children's diseases, in which, naturally, sunlight and ultraviolet therapy also play a large rôle.

—R. T. Frank.

In this amusing little booklet, *Expectant Fathers*,⁴ the author defends his plea that expectant fathers are entitled to some consideration on the part of attending obstetricians and especially maternity hospitals, in view of the lavish attention commonly bestowed on the expectant mother. No doubt, something ought to be done for them. His suggestion for a Bulletin Board announcing from time to time the progress the wife is making is not so bad. He seems particularly impressed with twilight sleep and one cannot escape the feeling that with greater benefit, at least for the attending obstetrician, twilight should be administered to the waiting husband—after all what difference would it make if he were a bit blue after it is all over? However, we agree with the advice on the blurb—this book should be kept in the doctor's waiting room and several copies in the anterooms of maternity wards.

—Dr. Hugo Ehrenfest.

Dr. Crossen's *Diseases of Women*⁵ has become a classic in gynecologic literature. The logical arrangement of the topics, the thoroughness of illustration and the lucidity and conciseness of discussion combine to produce a volume of unusual worth.

This present book fully maintains the standards set by the former editions. The name of Dr. R. J. Crossen appears for the first time as a co-author, and his revision of the section on sterility gives a most complete discussion, theoretical and clinical, with full reference to many of the most recent suggestions regarding this often baffling condition. It is of interest to note a section on therapeutic contraception.

Dr. Hugo Ehrenfest has brought the chapter on the Internal Secretory Glands in Relation to Gynecology quite up-to-date with a review of the newer conception of the physiology of menstruation based upon the work of Aschheim and Zondek, Frank, Allen and Doisy, and Smith and Engle. We can hope with the author for the early offering of a pure and standardized anterior pituitary hormone in order that organo-therapy may be put on a scientific and rational basis.

Dr. H. S. Brookes, Jr., is responsible for a new chapter on the Lower Intestinal Tract in Relation to Gynecology. It is surprising how much practical information, diagnosis, and treatment has been packed in these twenty pages.

It is apparent that the gynecologic literature of the past few years has been closely scrutinized and few, if any, true advances or suggestions of real merit will be found to have been omitted in this revision.

—Philip F. Williams.

⁴*Expectant Fathers. Their Care and Treatment.* By Douglas V. Martin. Illustrated. St. Louis, 1930. De Vass Publishing Co., Wainwright Building.

⁵*Diseases of Women.* By Harry Sturgeon Crossen and Robert James Crossen. 7th ed., St. Louis, 1930. The C. V. Mosby Company.

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PRESIDENTIAL ADDRESS*

AMERICAN GYNECOLOGICAL SOCIETY

BY CHARLES C. NORRIS, M.D., PHILADELPHIA, PA.

NOTHING in my medical career has given me greater pleasure than to be elected to the distinguished office of President of this Society, and I wish to extend to the Fellows my sincere thanks for the honor bestowed upon me one year ago. I know of no position within the gift of the medical profession that I could prize more highly and I feel deeply the distinction accorded me.

At this time it is my painful duty to record the name of Dr. Harold Capron Bailey, a former member of this Society, who died during the past year. Dr. Bailey was a keen scientist, and his loss will be felt by many without as well as those within this Society. The death of Dr. Charles M. Green is regretted by all who had the privilege of knowing him. We have also lost through death during the past year our Honorary Fellow, Dr. Theodore Tuffier of Paris. Dr. Tuffier was perhaps best known to the gynecologic world by his work on ovarian transplantation. He was a skillful operator, and a surgeon of wide experience and excellent judgment.

In this, the oldest national gynecologic society in the world, the presidential chair has been occupied by the most illustrious members of our branch of the profession. A study of the Transactions of former years reveals the fact that the presidential addresses of my predecessors are uniformly of a commensurately high order, and reflect the brilliant

*Read at the Fifty-fifth Annual Meeting of the American Gynecological Society, Hot Springs, Va., May 19, 1930.

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

attributes and erudition of their distinguished authors. While these findings tend to enhance the honor that you have conferred upon me, they also serve to magnify my own shortcomings and render more difficult the selection of a suitable topic for my address.

To follow the masterly achievements of Chipman, Miller, Ward, Brettauer, Hirst, and Curtis, to mention at random only a few of the most recent workers, but augments the present difficulty.

To glance in retrospect at conditions prior to the organization of this Society is not lacking in interest. Haggard has recently pointed out that the progress and retrogression of civilization are nowhere more clearly apparent than in the study of childbirth. Among primitive peoples childbirth is considered a natural process, and hence is treated with indifference or even with brutality. At the height of the Egyptian, Greek and Roman civilization the childbearing woman was accorded definite consideration, and the art of obstetrics had reached a considerable stage of development. The technic and indications for version were known, and the obstetric chair and vaginal speculum in common use. With the advent of Christianity practical measures to facilitate childbirth were more or less replaced by prayer and faith, and the fact that the mediæval Christian viewed childbirth as a process the result of carnal sin and that was to be expiated by pain, militated against progress along this line. Indeed, until comparatively recent times the old indifference to the suffering of women during parturition, and the religious opposition to the employment of anesthetics for the alleviation of the pain, constitute a peculiar chapter in medical history. It was not until Sir James Y. Simpson in an effort to overcome this prejudice directed his logical and humane arguments at some of the leading divines of his time that the opposition of the clergy was finally overcome. The administration, with her consent, of chloroform during one of her confinements, to the late Queen Victoria, marked a further advance in the use of obstetric anesthesia.

For many centuries the mortality attending childbirth was enormous. The really primitive woman has little cause to fear childbirth unless a malposition exists. In the present day, however, there are but few races that have not been brought into contact with civilization, and as a consequence the lives of their women and their offspring are threatened by mongrelization, venereal diseases, rickets, tuberculosis, and alcoholism. Often, too, they become the victims of filthy midwives or of unclean physicians. Garrison describes obstetrics as the worst phase of Renaissance medical practice. Our knowledge of mediæval obstetrics is meager, but one may gauge the extent of its abasement by the manner in which labor was conducted during the Middle Ages. Garrison states that in normal labor a woman had an even chance for life. Puerperal fever and eclampsia were the chief factors influencing the mortality. When dystocia occurred, the patient was usually sub-

jected to the deadly ministrations of a "Sairey Gamp" or a vagabond "surgeon," or perhaps even a swineherd. In 1580 a law was passed in Germany that had for its object the restraining of shepherds and herdsmen from officiating at childbirth. It was not until the Sixteenth Century that real progress in the practice of obstetrics was apparent. Up to this period, and even later, it was generally believed that, as a result of labor pains, the pelvis opened out like a broken hoop, permitting an easy exit for the child. So learned and accurate an observer as Ambroise Paré accepted this theory. He, however, brought to light and clearly described podalic version, which had been practiced among the ancient Greeks, and which was probably first employed about 200 A.D. by Soranus, and is described in detail by him in his treatise on midwifery and diseases of women.

During Paré's time a school for midwives was established at the Hôtel Dieu. It was during the Eighteenth Century that the care of women during childbirth began to pass from the midwife's hands to those of the trained accoucheur. In 1628 Peter Chamberlen attended Queen Henrietta Maria during a miscarriage, and thirty-five years later Boucher served in the capacity of obstetrician to La Vallière. In 1692 Hugh Chamberlen delivered the future Queen Anne.

In these early days male obstetricians merely acted in the capacity of assistants, and in some cases they were excluded from the delivery room unless complications arose. In England the change in public sentiment was largely due to the efforts of William Smellie and his pupil, William Hunter, and in Ireland to Sir Fielding Ould. On the Continent the case of the male accoucheur was upheld by Röderer in Göttingen, Campes in Amsterdam, Baudeloque and Levret in France, Boër in Vienna, and Saxtorph in Copenhagen. Smellie conducted a course in obstetrics employing a leather-covered manikin supported by a human pelvis. He also devised a specially designed curved and double curved forceps, and invented a steel lock for these instruments, which had formerly been usually bound together with thongs. Hunter was the first to describe the decidua reflexa, and to make accurate studies of the pregnant uterus. His disastrous experiment on himself, which resulted in the retardation, for upward of seventy years, of the scientific treatment of gonorrhea, is too well known to require description. Hunter was a vigorous opponent of the use of the obstetric forceps, and was wont, in substantiation of his belief in noninterference, to exhibit to his students his own rust-coated instruments. In 1773, Charles White, a Manchester surgeon, published an admirable treatise on obstetrics, which embodied the results of considerable pioneer work on aseptic midwifery, and stressed the importance of scrupulous cleanliness in the conduction of childbirth.

The mechanism of labor was first described in 1701 by Deventer, and later by Sir Fielding Ould. There is nothing in medicine more inter-

esting than the history of obstetrics. The charlatan Chamberlen, the courageous Mariceau, the scholarly and astute Holmes, the pathetic Semmelweis, the brilliant but obstinate Hunter; Pasteur, Lister, McDonald, Atlee, Sims, Tait, Noeggarth, the dramatic discoveries of Long, Morton, Wells, and Simpson, these go to make up the most fascinating chapters in the history of medicine and have been graphically described before to this Society in previous presidential addresses.

Prior to 1850 operative gynecology as an independent specialty had no real existence. Among the few contributions may be mentioned Robert Houstoun's treatment of ovarian dropsy by tapping in 1701; fifty-six years later William Hunter's proposed excision of ovarian cysts, and in 1770 his important observations upon retrodisplacement of the uterus; Matthew Baillie's study of dermoid cysts in 1789, and Soemmerring's essay on the injurious effects of corsets in 1793.

In response to an invitation issued on May 24, 1876, a group of gynecologists from various parts of the United States met at the Hall of the Academy of Medicine, New York City, on June third of that year, for the purpose of organizing a Gynecological Society. The meeting was called to order by James R. Chadwick, of Boston, and The American Gynecological Society was formed with thirty-nine members. Edmund R. Peaslee served as chairman. The first annual meeting was held on September 3, 1876, and Fordyce Barker was elected president. At this meeting a number of noteworthy papers were read including those by Emmet, on plastic surgery, and by Noeggerath, on latent gonorrhea. The latter's views were vigorously opposed by the members, one speaker going so far as to state that "One regards leucorrhœa as a natural condition, present in all women after marriage."

At the time of organization, fifty-four years ago, obstetrics as practiced today was unknown. Since then the treatment of practically every obstetric complication and gynecologic condition has undergone radical changes, and improvement has taken place along all lines. During those early days cesarean section was attended by an enormous mortality, whereas now it is a common procedure and a life-saving measure. In those days extrauterine pregnancy usually terminated fatally.

Sired by surgery and the legitimate offspring of obstetrics, gynecology has shed its swaddling clothes and emerged a full-fledged entity, to become one of the foremost specialties of our time.

The Transactions of this Society constitute a complete record of the development of obstetrics and gynecology to the present time. Every obstetric or gynecologic procedure is described and discussed therein, the steps in the development of the art as well as the various theories advanced regarding the etiology and nonsurgical treatment of the diseases of women. The discussions were formerly more vigorous and controversial in nature than they are today.

I congratulate the Fellows of this Society upon the character of their work and particularly the members of the Council, those of the past as well as of the present. Every decade has shown definite advancement, both in scientific achievements and in developing more efficient methods of relieving our patients.

Brilliant and interesting as the past may have been we must also consider the future, for in it lies the very existence of our organization. In his presidential address to the American Medical Association a few years ago, Charles H. Mayo stressed the need for cooperation in the profession. "The medical man, taken individually, is usually self-sacrificing and patient, and aims to uphold the tenets of his calling. On the other hand, taken collectively, we of the profession do not possess sufficient influence, due largely to a lack of unity." Society as a whole appreciates the saving of a human life, but fails to realize the vast advantages of prophylactic surgery and obstetrics. America leads in operative gynecology, but lags in research work, although the last few years have shown a definite improvement in this field of endeavor. The late John G. Clark, in his presidential address before this Society, brought out a fact that is worthy of repetition, namely, that but few men are capable of doing really good research work. In every graduating class there are perhaps one or two men who are qualified to undertake this branch of investigation. All too often, due to a lack of financial resources or for other reasons, these workers are forced to enter other more profitable fields. A system should be devised whereby such workers may be encouraged and permitted to follow the bent for which they are most suited, in a field in which workers are so urgently needed. It should be stressed further that although research is of the utmost value, it is useful only when it is directed along practical lines. This is a point that I wish to emphasize and one that it is difficult to correct without hampering the research worker. It is nevertheless a fact that today much time and labor are wasted in misdirected efforts in our research laboratories. The laboratory that is dissociated from the clinic is generally of little or no value so far as the advancement of the cause of medicine is concerned. It is most desirable that there be close cooperation between the so-called practical branches and the study of physiology. In teaching institutions occasional conferences between the heads of the Surgical, Gynecological, and Obstetrical Departments and the Professors of Physiology and Experimental Surgery will do much to direct laboratory work into practical channels, and inculcate into the minds of the students the value of properly directed research.

At the present day the infant and maternal mortality rate has shown but slow improvement, largely due to the fact that the majority of women are delivered by the general practitioner or the midwife. Obstetric teaching should stress the early recognition of complications rather

than the technic of treating them, and should aim to instill into the pupil's mind the importance of early hospitalization for all such cases, as well as the need for employing aseptic methods. It is my belief that the average obstetric case goes through labor without an accurate diagnosis of the presentation having been made, and without recognition, on the part of the accoucheur, of the potentialities for dystocia. Prenatal care is often only a farce or may have been omitted altogether.

There is a tendency, in every age, to assume that the zenith has been reached, and every investigator has been prone to wish that he had been born sooner, in order that he might have been the one to discover some of the apparently almost self-evident advancements that have been achieved. In spite of the progress that has been made, both in invention and in technic, we are still at the portal, and only as the result of hard work and honesty may we enter the chamber which still holds so many of nature's secrets, and which it is our privilege to explore. Merely in the way of suggestion, and as the result of careful thought, it would seem to me that the following subjects especially require further development: The careful auditing of end-results, as suggested by Codman and as practiced by Ward and many others. Only as the result of such studies are we enabled to compare the effects of the various methods of treatment and of operation, a point that is too self-evident to require discussion. Unfortunately, follow-up studies are expensive, and the gynecologist and obstetrician is often too busy with the immediate needs of his patients to give sufficient time to this important part of his work. Hospital chiefs should demand that their institution managers provide a qualified staff to conduct a follow-up department, and should see to it that the work is properly carried out. Advancement in the treatment of malignant neoplasms and, in fact, in all gynecologic diseases, and in many obstetric complications, is impossible unless end-results are available for purposes of comparison, evaluation, and study. The histologic diagnosis of malignant neoplasms, especially those arising in the female genital tract, is a subject fraught with error and inaccuracy in many hospitals. The general pathologist especially is frequently ignorant of this important and practical phase of his work. The formulation of a simple method of classifying the advancement of genital carcinomas is urgently required, and such a classification this Society could standardize authoritatively. Until this is accomplished and accepted by the medical world we have no definite means at our command on which to base a prognosis in the individual case. The results secured in the treatment of any series of malignant tumors mean little unless the character and stage of advancement of the growths are known. A further study of histologic grading and radio-susceptibility of malignant genital neoplasms appears worthy of future efforts. An end-result study of the condition of children who have been delivered with the aid of the high forceps or by version is also desirable. The

fact that an infant is alive or even apparently well at the time of the discharge of the mother from the maternity hospital some twelve or fourteen days after delivery does not prove positively that no injury has been sustained that may later affect the health or mentality of the child.

There are many other subjects that occur to me as being especially worthy of investigation, but I do not wish to trespass further upon your time. I cannot, however, leave this subject of specific suggestions without a plea for a thorough and personal study of the individual case. Many mistakes are the result of undue haste. The improvement in operative technic and the consequent lowering of the mortality rate tend to lessen thorough preliminary study. There are few gynecologic symptoms that cannot be reproduced by nongynecologic conditions, and the busy gynecologist may readily develop the habit of gaging every ailment through the narrow confines of a bivalve speculum. Laboratory tests have been multiplied in number and improved in technic, but while reliance may be placed on them, we should not be altogether dependent upon them. Invaluable as they are, they should not be permitted to become the master of the clinician.

Speaking for the future of this Society, there is but little to say. We are well and safely guarded by an able Council. To our Secretary and Treasurer, present officers and past, our thanks are due for the able manner in which they have performed their arduous tasks. As was pointed out by Fordyce Barker in the first presidential address, the reputation of the Society is largely dependent upon the character of our contributions, and although our Council is empowered to accept or to reject papers, the duty of making the selection actually falls largely upon our secretary who, in common with those who have preceded him, has performed this important and difficult work with judgment and discretion.

The population of the nation is increasing rapidly. This must eventually result in an increase in the number of gynecologists and obstetricians, which may ultimately demand an augmentation of our membership. In my judgment this should be slow, and is not required at the present time.

In closing I wish again to express to you my deep sense of indebtedness for the honor you have conferred upon me; to thank you individually for the help and friendship you have given me in the past, and for a continuance of which I look hopefully forward to in the future.

THE INCIDENCE OF PUERPERAL INFECTION DUE TO ANAEROBIC STREPTOCOCCI*

By T. K. BROWN, B.S., M.S., M.D., ST. LOUIS, MO.

OWING to the fact that frequently cases of puerperal infection were encountered in which repeated bacteriologic examinations had been negative, it was felt that these infections were probably due to anaerobic organisms, and to recover these organisms and to properly understand these cases, it would be necessary to incubate blood and uterine cultures under anaerobic as well as aerobic conditions. Since July, 1924, we have been incubating our uterine and blood cultures aerobically and anaerobically. In a very short time we were able to convince ourselves of the accuracy of Schottmueller's previous work, having found that anaerobic streptococci play a major part in puerperal infection in our clinic.

Schwarz and Dieckmann, in 1926, reported our experiences with puerperal infection from July, 1924, to September, 1926. They found that anaerobic streptococci were the most frequent offenders in their cases. Table I shows the summary of this report. It is my object in this paper to continue the report which now covers the time from July 1, 1924, to December 31, 1929, an additional period of three and one-fourth years. Since the publication of the article of Schwarz and Dieckmann, Harris and J. H. Brown have published several articles, which further indicate that anaerobic streptococci play a considerable rôle in puerperal infection. This is interesting, because before the report of Schwarz and Dieckmann, it was generally considered that Schottmueller's ideas concerning the frequency of anaerobic streptococcal infections were too sweeping.

TABLE I. TYPES OF PUERPERAL INFECTION

| NUMBER OF ADMISSIONS JULY 1, 1924, TO SEPT. 1, 1926 | | NUMBER OF DELIVERIES | NUMBER OF CASES OF PUERPERAL INFECTION | | NUMBER OF DEATHS | |
|---|-----------------|----------------------|--|----------------|-------------------|-----------|
| 2194 | | 1913 | 45 | | 10 | |
| TYPE OF INFECTION | NUMBER OF CASES | AEROBIC BACTERIA | ANAEROBIC STREPTOCOCCI | MIXED BACTERIA | NEGATIVE CULTURES | MORTALITY |
| Acute endometritis | 42 | 11 | 27 | 3 | 1 | 0 |
| Pelvic cellulitis | 11 | 4 | 6 | 1 | | 0 |
| Peritonitis | 7 | 1 | 4 | 2 | | 6 |
| Pelvic abscess | 3 | 1 | 1 | 1 | | |
| Pelvic thrombophlebitis | 9 | 0 | 6 | 0 | 3 | 3 |
| Bacteriemia | 15 | 4 | 10 | 1 | | 1 |

With the exception of the recent investigations of Harris and J. H. Brown, and Schwarz and Dieckmann, no large amount of work

*From the Department of Obstetrics and Gynecology, Washington University School of Medicine, the St. Louis Maternity Hospital, and Barnes Hospital.

had been done on anaerobic streptococcal infections in the puerperium. Burckhardt, in 1912, discussed the question of sapremia and bacteriemia. He was able to show in several cases that organisms, which are usually regarded as saprophytes and as harmless inhabitants of the genital tract, could become invasive. These organisms were chiefly anaerobic streptococci. Friedrich, in the same year, reported a series of infections which were due to anaerobic streptococci, but owing to the fact that he obtained few positive blood cultures in these cases, he felt that these organisms were not so invasive as Schottmueller had led us to believe. Bingold, in Schottmueller's clinic in 1921, reported further on this work, and in 1923 Schottmueller recorded 72 fatal cases of puerperal infection following delivery due to anaerobic streptococci from a total of 231 fatal cases. In an article appearing in September, 1928, Schottmueller gives his most recent experiences and opinions concerning puerperal infection. He emphasizes the large rôle played by anaerobic streptococci, and feels that they offer just as great a problem as do hemolytic streptococcal infections. He thinks that these anaerobes are organisms which in most instances the patient herself harbors in contradistinction to other pathogenic organisms, which are usually introduced into the vagina from without. As he sees it, other pathogenic organisms can be kept out of the vagina by proper technic, but the anaerobic organisms are mostly ordinary inhabitants of the vaginal tract. He remarks, therefore, that the dangers of puerperal infection are greater from within than from without. The question of auto-infection was also raised by Schwarz and Dieckmann in their second report on this subject.

Harris and J. H. Brown, in January, 1929, published their experiences in 113 cases of streptococcic puerperal infection, covering a period from July 9, 1926, to August 9, 1927. In this very elaborate report, they concluded that 67 per cent of all their infections were due to various types of streptococci. Secondly, evidence is offered which seems to show that puerperal infection due to beta-hemolytic streptococci is almost invariably exogenous. Puerperal infection due to gamma-non-

TABLE II

| | WHITE | COLORED |
|-------------------------|-------|---------|
| Aerobic: | | |
| Beta | 7 | 10 |
| Alpha | 0 | 1 |
| Alpha viridans | 5 | 7 |
| Gamma | 4 | 15 |
| Anaerobic: | | |
| Alpha viridans | 3 | 2 |
| Viridans (nonhemolytic) | 0 | 1 |
| Gamma | 8 | 40 |
| | 27 | 76 |

hemolytic streptococci is probably endogenous in origin in most cases, and in their series they were found to occur five times more frequently in colored women than in white. Aerobic and anaerobic streptococci were found with almost equal frequency, which emphasized the necessity of anaerobic culture methods in suspected cases of streptococcic puerperal infection.

Harris and J. H. Brown, in their series of 113 cases of puerperal infection due to streptococci, differentiated these organisms into various groups, and Table II shows their incidence in white and colored patients.

From the work of Harris and J. H. Brown, it will be readily seen that anaerobic streptococci are of considerable importance in puerperal infection, and that they are most probably endogenous in character in the majority of cases, as suggested by Schottmueller, Schwarz and Dieckmann, and themselves.

We have classified the cultures from our cases of infection into the aerobic and anaerobic groups, but have not carried the cultural studies much further, up to the present time. Apparently there is a large number of anaerobic streptococci, which are similar enough to be grouped together, but varying somewhat in their cultural characteristics. Prevot has classified a few of these organisms. Harris and J. H. Brown also have classified their anaerobic streptococci as noted above. Many of the organisms found to be pathogenic did not answer the requirements of the *Streptococcus putridus* as described by Schottmueller, but produced clinical pictures of similar type, but of varying degrees.

The organisms are nonhemolytic streptococci, growing under anaerobic conditions, producing gas with a characteristic foul odor, and proteolytic as shown by digestion of meat media. The odor of the cultures is similar to the odor noted at the bedside. The pathogenicity of the organisms is apparently proportional to the proteolytic property of the organism. In a few cases we have found some anaerobic bacilli present, but these have always been in the minority, and evidently are relatively unimportant.

In Table III, which is a summary of our bacteriologic experiences in a period of five and one-half years, it will be seen that anaerobic streptococci are concerned in the majority of these infections. In comparing the septicemia cases in Table I and Table III, it will be seen that only one case of anaerobic septicemia was positively diagnosed clinically. Several of these cases came to autopsy and the same anaerobic organism, which had been previously isolated from the uterus, was recovered from various organs at autopsy. This indicates that the organisms do not live in the blood stream, but must be obtained in culture at time when dissemination from some focus is taking place. The best time is probably suggested by the occurrence of a chill.

In September, 1926, our attention was called to an article by Bessesen, in which he attempted to explain some ways in which uterine infection could take place during labor, and particularly emphasized the use of a mixture for instillation in the vagina during labor. This mixture contained glycerin, mercurochrome, and tincture of iodine. We have been using this preparation since September, 1926, in the following strength:

15 gm. mercurochrome crystals,
5 c.c. of one-half strength tincture of iodine, in
500 c.c. of glycerin.

TABLE III. TYPES OF PUERPERAL INFECTION

| NUMBER OF ADMISSIONS JULY 1, 1924 TO DECEMBER 31, 1929 | | NUMBER OF DELIVERIES | NUMBER OF CASES OF PUERPERAL INFECTION | | NUMBER OF DEATHS | |
|---|-----------------------|-------------------------|---|-------------------|----------------------|----------------|
| 7,579 | | 6,407 | 112 | | 21 | |
| TYPE OF INFECTION | NUMBER OF CASES | AEROBIC BACTERIA | ANAEROBIC STREPTOCOCCI | MIXED BACTERIA | NEGATIVE CULTURES | MOR- TALITY |
| Acute endometritis | 108 | 30 | 61 | 16 | 1 | 0 |
| Pelvic cellulitis | 22 | 7 | 12 | 3 | 0 | 0 |
| Peritonitis | 14 | 2 | 6 | 6 | 0 | 11 |
| Pelvic abscess | 10 | 4 | 4 | 2 | 0 | 1 |
| Pelvic thrombophlebitis | 14 | 2 | 9 | 0 | 3 | 4 |
| Septicemia | 25 | 10 | 11 | 4 | 0 | 5 |
| Cases of suspected endometritis | 13 | 0 | 0 | 0 | 13 | 0 |

Bessesen reported improvement of results with this instillation. We have injected this mixture routinely in labor, at first only in colored patients, but during the last two years in all ward cases. Realizing that anaerobes are usually present in the vagina, we felt that the most practical way to combat these organisms would be by the use of some form of antiseptic solution or mixture. The use of Bessesen's mixture was aimed chiefly at anaerobic infections. It was not used because we thought that this was the best mixture, but we felt that our results with its use were at least suggestive of its value. We are now working on other preparations which we hope will prove even more valuable, as we feel that vaginal antiseptics will prove the most logical means of preventing these infections, which, once they are started, give rise to the most malignant types of thrombophlebitis and pyemia, to say nothing of other local lesions characteristic of the usual pathogenic organisms. Seven c.c. of this modified Bessesen preparation are instilled in the vagina, and repeated about every twelve hours if labor is prolonged. In waiting cases in which the membranes have ruptured before the onset of labor, the same amount is injected daily.

Table IV shows the comparison of the deaths on the basis of admissions of the first and second parts of the series. It is necessary to point out that the deaths following full time delivery due to infections

are very appreciably reduced. Also the morbidity from puerperal infection, chiefly cases of acute endometritis, has shown a very marked reduction. We feel these figures suggest that by the instilla-

TABLE IV. MORTALITY FROM PUERPERAL INFECTION

| | ADMISSIONS | DEATHS | PERCENTAGE |
|----------------------------|------------|--------|------------|
| July, 1924, to Sept., 1926 | 2,194 | 10 | 0.45 |
| Sept., 1926, to Jan., 1930 | 5,385 | 11 | 0.20 |

Of the 10 deaths between July, 1924, and September, 1926, 5 were infected before admission.

Of the 11 deaths between September, 1926, and January, 1930, 7 were infected before admission.

MORTALITY FROM PUERPERAL INFECTION

| | DELIVERIES | DEATHS | PERCENTAGE |
|----------------------------|------------|--------|------------|
| July, 1924, to Sept., 1926 | 1,913 | 5 | 0.261 |
| Sept., 1926, to Jan., 1930 | 4,494 | 4 | 0.089 |

MORBIDITY FROM PUERPERAL INFECTION

| | ADMISSIONS | INFECTIONS | PERCENTAGE |
|----------------------------|------------|------------|------------|
| July, 1924, to Sept., 1926 | 2,194 | 45 | 2.05 |
| Sept., 1926, to Jan., 1930 | 5,385 | 67 | 1.24 |

MORTALITY PER NUMBER OF CASES

| | NUMBER OF CASES | DEATHS | PERCENTAGE |
|----------------------------|-----------------|--------|------------|
| July, 1924, to Sept., 1926 | 45 | 10 | 22.2 |
| Sept., 1926, to Jan., 1930 | 67 | 11 | 16.4 |

tion of an antiseptic preparation which is retained in the vagina, we have appreciably reduced our morbidity and mortality in these cases. We think that this work is encouraging and further experiments should be carried out. Serologic and immunologic studies with these anaerobes should be made. However, we feel at present that the simpler and more practical method of attack against these anaerobes is by vaginal anti-sepsis.

Lash, producing active immunization of pregnant and puerperal women against hemolytic streptococci, has recently shown that the incidence of puerperal infection in 1216 women, who were not immunized, was 2.8 per cent, while in 1261 puerperal women, who were vaccinated with streptococcal vaccines and toxins, it was only 0.87 per cent.

In view of the experiences of Schottmueller, Harris and J. H. Brown, and our own, all pointing out that anaerobic infections play a considerable part in puerperal infection, the routine immunization of patients against hemolytic streptococci does not seem practical. It is, of course, well recognized that hemolytic streptococcal infections are introduced; therefore, by the proper technic and limited manipulations,

the incidence of these infections can be reduced to a negligible minimum. This is the experience of every well-regulated obstetric clinic as well as our own for the last five and one-half years. The greatest problem in puerperal infection as we see it, is the combating of these anaerobic infections. To do this, all clinics dealing with puerperal infections must incubate uterine and blood cultures both by aerobic and anaerobic methods; only thus the true incidence of anaerobic infections can be appreciated. With these facts generally recognized, methods will develop which should reduce very materially the incidence of this type of infection.

Of 55 cases of puerperal infection on the service of the St. Louis Maternity Hospital between August 15, 1927, and December 31, 1929, 30 patients (54 per cent) gave evidence of infection upon admission. This is an incidence of one case of puerperal infection in every 145 deliveries, with a mortality of 20 per cent. The incidence of infection in our material is almost four times as great in the colored women as in the white, as the following figures show:

Postpartum cases:

| | |
|---------|---------------------------|
| White | 19 or 1 to 186 admissions |
| Colored | 16 or 1 to 48 admissions |

Abortions:

| | |
|---------|---------------------------|
| White | 16 or 1 to 221 admissions |
| Colored | 4 or 1 to 194 admissions |

55

Table V is a brief outline of the fatal cases of puerperal infection in our entire series. It is interesting to note the duration of pregnancy and the condition of the patient as regards infection before admission to the hospital; and the type of organisms prevailing in those cases infected after admission. Several cases of *Staphylococcus albus* are noted. These cases, after a careful search, were traced to rubber gloves which were improperly sterilized, due to defects in the sterilizing apparatus. With these conditions corrected, these infections at once disappeared.

There has been a good deal of discussion as regards the conservative and more radical treatment of puerperal infection. Our technic is rather active, as has been fully described in the previous paper by Schwarz and Dieckmann. There also has been a good deal of discussion concerning the invasive character of anaerobic streptococci, and whether or not this invasiveness is increased in the case where the patient is treated entirely along conservative lines. We believe that conservative treatment in the face of an anaerobic infection is illogical, and hope to show this in another report on a study of the material removed at the time the uterus is cleaned out. The following outline of

TABLE V

| PATIENT'S HISTORY NO. | DURATION OF PREGNANCY | INFECTED BEFORE ADMISION | CRIMINAL ABORTION | UTERINE CULTURE TYPES OF ORGANISMS | BLOOD CULTURE TYPES OF ORGANISMS | EXTENT OF PATHOLOGIC LESIONS AT DEATH | CHARACTER OF DELIVERY | AUTOPSY |
|-----------------------|-----------------------|--------------------------|-------------------|-------------------------------------|----------------------------------|---|--|----------------------------|
| B. H. | | | | | | | | |
| 0-5832 | 20 wk. | No | - | None | Hemolytic strep. | Endometritis septicaemia | Ectopic unoperated | No. 2409 Coroner's case |
| 0-6250 | 2 mo. | Yes | Yes | Strep. putridus Anaerobic strep. | Strep. putridus An. strep. | Endometritis, infarct of lung, septicaemia, pelvic thrombophlebitis | | No |
| 0-6783 | Term | No | - | Anaerobic strep. | Neg. | Endometritis, peritonitis, pneumonia | Cesarean section | No |
| 1867 | 36 wk. Induced | No | - | Anaerobic strep. | Anaerobic strep. | Acute endometritis, pelvic thrombophlebitis, septicaemia, embolic pneumonia | Twins, first spontaneous, second breech extraction. Macerated fetus | No |
| 3706 | Term | Yes | - | Strep. hemolyticus | Strep. hemolyticus | Septicaemia, peritonitis, endometritis, pneumonia | Spontaneous | No. 2784 |
| 4003 | Term | ? | - | Anaerobic strep. | Anaerobic strep. | Peritonitis, general pelvic abscess, endometritis, septicaemia | Cesarean section | No. 2817 |
| 4173 | 36 wk. | Yes | - | Anaerobic strep. | Neg. | Pelvic thrombophlebitis, pulmonary embolus (Ca. of uterus) | Cesarean section. Supravaginal hysterectomy | No |
| 4668 | Term | Yes | - | Anaerobic strep. | Neg. | Peritonitis, general | Cesarean section. | No. 2828 |
| 4899 | Term | Yes | - | Anaerobic strep. | B. coli Anaerobic strep. | Septicaemia, endometritis, pelvic cellulitis | Supravaginal hysterectomy | No |
| 6504 | Term | No | - | Staph. albus hemolyticus | Staph. albus hemolyticus | Endometritis, infarct of lung, peritonitis | Instrumental, 11 days before admission | No |
| 6702 | 2 wk. | Yes | Yes | None | Strep. viridans | Septicaemia, infarct of kidney and spleen, thrombosis of cerebral artery | - | No. 2949 |

TABLE V—CONT'D

| PATIENT'S HISTORY NO. | DURATION OF PREGNANCY | INFECTED BEFORE ADMISION | ABORTION | | UTERINE CULTURE | | BLOOD CULTURE | | EXTENT OF PATHOLOGIC LESIONS AT DEATH | CHARACTER OF DELIVERY | AUTOPSY |
|-----------------------|-----------------------|---|----------|-------------|---|---------------------|--------------------|--------------------|---|---|---|
| | | | CRIMINAL | SPONTANEOUS | TYPES OF ORGANISMS | TYPES OF ORGANISMS | TYPES OF ORGANISMS | TYPES OF ORGANISMS | | | |
| M. H. 22 | 32 wk. | Yes | - | - | Anaerobic strep. | Neg. | | | Endometritis, peritonitis, ruptured uterus | Breech with contracted pelvis | No. 3151 Autopsy Bl. culture, an. strep. No. 3167 |
| 210 | 3 mo. | Yes | Yes | - | Staph. albus Anaerobic strep. | Staph. albus | | | Septicemia, endometritis, embolic pneumonia, pelvic thrombophlebitis | - | |
| 215 | 36 wk. | Yes | - | - | Anaerobic strep. | Neg. | | | Endometritis, peritonitis, thrombophlebitis, embolic pneumonia (extreme postmortem autolysis) | O.P.D. Premature stillborn | No. 3172 |
| 1766 | 5 mo. | Yes | - | Yes | Strep. hemolyticus | Neg. | | | Endometritis, peritonitis | Spontaneous | No. 3388 |
| 3447 | Term | No | - | - | Nonhemolytic strep. | Nonhemolytic strep. | | | Septicemia, cerebral embolus, endometritis, bronchial pneumonia | Spontaneous breech (membranes ruptured 36 hr.) | None |
| 5139 | Term | Yes | - | - | None (culture of pelvic abscess—anaerobic strep. B. coli) | Neg. | | | Endometritis, pelvic abscess | O.P.D. Short labor | No. 3792 |
| 5298 | 5 mo. | Yes | - | Yes | Anaerobic strep. | None | | | Endometritis, peritonitis, appendicitis | Spontaneous | No. 3785 |
| 5915 | 38 wk. | ? (Membranes ruptured 3 days before livery) | - | - | Staph. albus Anaerobic strep. | Neg. | | | Endometritis, peritonitis | Cesarean section | None |
| 6112 | Term | No | - | - | None (peritoneal culture, an. strep., Staph. albus) | Anaerobic strep. | | | Septicemia, peritonitis | Spontaneous with retained placenta, supravaginal hysterectomy | None |
| 6148 | Term | No | - | - | Staph. albus | Staph. albus | | | Endometritis, septicemia | Cesarean section | None |

one of our recent cases clearly demonstrates the invasive character of these organisms under the conditions of conservative treatment.

The patient, who had missed one menstrual period, had a criminal abortion performed about three weeks after missing her period, and about three weeks before admission to the hospital. She was sent into the hospital on the medical service by an outside physician. Repeated blood cultures were negative and the history of abortion was not obtained until four weeks after the patient had performed it. Five weeks after the abortion, with the patient practically moribund, a uterine culture merely for diagnosis was taken, and a considerable amount of chorionic tissue was removed, in spite of the rather early pregnancy. Anaerobic streptococci and *B. coli* were obtained and many streptococci were found in the débris removed. The patient died the next day, and an autopsy was performed. Anaerobic streptococci were recovered from the pleura, lung, and the uterus. We feel that this case illustrates very definitely the invasive character of anaerobic streptococci in a case which is allowed to run its own course. A brief outline of the history of this case, and an abstract of the pathologic report follows.

Jan. 16, 1930. M. O. No. 23204. Admitted Barnes Hospital. Aged twenty-eight. Unmarried. C. C.: Weakness. Chills. Impression: pulmonary tuberculosis. Miliary tuberculosis. Septicemia with pelvis as focus.

Jan. 17, 1930. Blood culture negative.

Jan. 20, 1930. Widal negative. Blood culture negative.

Jan. 23, 1930. Blood culture: streptococcus which did not grow on subculture. Obtained history of criminal abortion done three weeks before admission.

Jan. 25, 1930. Blood culture negative. Obstetric consultation requested.

Jan. 26, 1930. Transfusion of 500 c.c. of blood by Unger method.

Jan. 27, 1930. Obstetric consultation. Diagnosis: pelvic thrombophlebitis. Transfusion: 550 c.c. citrated blood.

Jan. 28, 1930. Uterine culture and douche. Removal of placenta. Culture (Anaerobic streptococci, *B. coli*). Transfusion: 550 c.c. citrated blood. Blood culture negative. Sputum anaerobic streptococci.

Jan. 29, 1930. Slight improvement. Chill in afternoon. Transfusion: 550 c.c.; blood culture: anaerobic streptococci. Died.

Autopsy: endometritis. Thrombosis of uterine veins. Multiple abscesses of the lungs. Cultures from pleura, lung, and uterus show anaerobic streptococci. Those of spleen and peritoneum were negative.

Autopsy Report.—Body of a fairly well-developed, fairly well-nourished white female; aged about twenty-seven years, of average height and weight. Liver and spleen are considerably enlarged, dark purple in color, and markedly congested. The uterus is enlarged; no evidence of peritonitis. The veins leading from the pelvic organs are markedly engorged. No thrombus, however, is located in the larger vessels outside the uterus.

As the chest plate is removed, a number of small abscesses along the anterior mediastinal border of the lungs are noted. As the lungs are removed, numerous similar areas are seen as hard yellow dots or spots, measuring from 1.5 cm. to pinpoint in size, and covered with fibrin over the pleural surface. Numerous small abscesses are seen throughout the lung substance, a little more numerous in the

lower lobes on both sides. They seem to be of different ages. Some of them are only small yellow dots, while others seem to be actual cavities, filled with blackish material. Undoubtedly all of them open into bronchi. One large one is located in the right upper lobe and measures 2 cm. in its greatest diameter, and burrows through the lung for a distance of about 5 cm.

No evidence of peritonitis.

The spleen is greatly enlarged and quite firm, dark purple in color. It measures 17.5 x 10 x 6.5 cm. and appears greatly congested. It offers some resistance to cutting. The pulp is firm, dark red in color, and cannot be scraped off readily with the knife. One small tubercle is seen.

All other abdominal organs outside the pelvis were negative.

The uterus is opened along the anterior surface. There is evidence of infection of moderate degree, but very little exudate into the cavity. The placental site is located in the fundus on the posterior wall.

Microscopic sections of the endometrium showed numerous organisms (streptococci) superficially. There are many small thrombi, the most superficial ones containing numerous streptococci. The right uterine and right ovarian vein showed organizing thrombi, but no bacteria could be demonstrated. The minute lung abscesses were loaded with streptococci.

CONCLUSIONS

Our experiences with anaerobic streptococcal infections in the puerperium during the last three and one-half years is very similar to that described in the previous report of Schwarz and Dieckmann in 1926. Puerperal infections due to ordinary pathogenic organisms in most instances are introduced infections, and infections due to anaerobic streptococci are usually endogenous. In the well-organized obstetric clinic, the problem of anaerobic streptococcal infection should be a greater one than infection due to the hemolytic streptococci and other pathogenic organisms. Good technic can practically eliminate hemolytic streptococcal infections, with some exceptions, as the recent epidemic at the Sloane Hospital for Women in New York City indicates. In the present state of our knowledge, anaerobic streptococcal puerperal infections will perhaps be best reduced by using some antiseptic preparation in the vagina at the beginning of and during labor. At the present time we recommend no particular preparation, but hope to determine by experience and experimental work what solution will prove most efficacious. We predict that this subject will be one that will command one of the most important investigations of the existing problems of modern obstetrics.

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OBSERVATIONS ON THE USE OF LOCAL ANESTHESIA IN GYNECOLOGIC OPERATIONS*

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LOCAL anesthesia has gradually come into prominence as means of avoiding the dangers of general anesthesia in minor operative surgery and in major surgery showing special complications that act as contraindications for general anesthesia. Its field of usefulness has been generally admitted for many years in dentistry, surgery of the extremities, lung surgery, and for the performance of cesarean section and episiotomy in obstetric surgery.

H. Braun¹ who is a pioneer in the field of local anesthesia suggests its use only in the minor gynecologic procedures about the external genitalia and in perineorrhaphies but he quotes Reclus as having done a vaginal hysterectomy for prolapse under local anesthesia. G. Labat² confines his recommendations of local anesthesia in gynecology to regional nerve block, and to the transsacral and spinal anesthesia. He uses the local infiltration anesthesia only in minor operations on the external genitalia. Farr³ has used local anesthesia for general abdominal surgery with considerable success. Gellhorn⁴ has been the first gynecologist to do extensive plastic work including vaginal hysterectomy under local anesthesia. His paper in 1927 stimulated considerable interest in the subject among gynecologists.

To be able to handle certain patients whose gynecologic condition is complicated by other pathology that contraindicates inhalation anesthesia, it becomes necessary to develop a method which will prove a safe substitute for general anesthesia without adding a second series of dangers equivalent to the first.

We have been gradually extending the use of local infiltration anesthesia in our gynecologic work. We have been surprised to find the extent to which this method can be applied to the field of operative gynecology.

Our earliest use of local anesthesia was in connection with episiotomy which we worked out in 1919 at the Lying-In Hospital. We next used it in doing perineorrhaphy and anterior colporrhaphy in selected cases. We then extended its use to dilatation of the cervix followed by curettage of the uterus. We next used it in the Watkins-Wertheim interposition operation, and then in the complete operation for procidentia including the anterior colporrhaphy, cervical amputation, perineorrhaphy and ventrofixation.

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The use of local infiltration in intraabdominal work, however, was limited to the occasional cesarean section which we have done under local anesthesia since 1920. Our early attempts to use the method in intraabdominal work were unsuccessful especially in those cases associated with inflammatory adhesions. We were unable to get sufficient relaxation or anesthesia to warrant its continued use until the last few months. This, we believe, to be due first to the fact that we used too little novocaine in our infiltration of the abdominal wall, and second because we had hesitated, for no good reason, to apply the infiltration method inside the abdomen for the relief of symptoms due to pulling on the broad ligaments or separating adherent adnexa and intestinal loops.

The purpose of the present investigation was:

1. To determine what gynecologic operations could be done under local infiltration anesthesia alone.
2. What benefit morphine and scopolamine would add as premedication.
3. What degree of shock, if any, attended major operations done under local anesthesia.
4. What effect the local infiltration might have on wound healing, and the immediate postoperative results.
5. How much interference might be expected with the identification of tissues and structures due to the distortion caused by the local injection.
6. What general postoperative complications might be expected such as vomiting, ileus, gas pains, shock, hemorrhage, peritonitis.
7. What complications of gynecologic conditions such as cardiac, renal, lung infections might be successfully handled by this method of anesthesia.
8. What methods of local infiltration are best adapted to various operations.

To begin with I wish to say that I hold no brief for the method of local anesthesia. We have no interest in sponsoring it in any way. We are interested in obtaining the answers to the foregoing questions, and submit herewith certain facts that we hope will be of some interest and will bring out a free discussion of the subject which will disclose the experience of this Society with regard to the procedure.

I must confess that the method was not especially indicated by complications in all of the cases that I am reporting, and that some of them might have been done as well under general anesthesia. The high percentage of successful anesthetics plus a desire to develop the technic in various types of operation suggested its use. No patient was operated upon, however, by this method without her consent, and with the understanding that we would give her general anesthesia if the pain got too severe.

One series of patients were operated upon without premedication except the routine one-fourth grain of morphine and $\frac{1}{150}$ of atropine one hour before the operation scheduled. A second group had the same thing one hour before operation and the scopolamine was repeated in a half hour. Another sixth of morphine was given if the patient seemed wakeful during the latter part of the operation, and this has become our routine for patients operated upon under local anesthesia.

With these points in mind we have been working for several years past to try to answer the previous questions. Some we seem to have fairly well settled, others will need considerably more critical study.

We have answered the first question in part by a list of the operations which we have already done, including dilatation and curettage, perineorrhaphy, anterior colporrhaphy, trachelorrhaphy, including denudation, Sturmdorf operation, amputation of cervix and advancement of bladder on the uterus and ventrofixation, vesicovaginal fistula repair, third degree lacerations of the perineum, ovariectomy, for large cysts (intraligamentary and extraligamentary), supracervical hysterectomy for fibroid uteri with adnexal pathology and dense adhesions, salpingoovariectomy, defundectomy and appendectomy, round ligament shortening (Gilliam, Baldy Webster), Watkins-Wertheim interposition operation, cesarean section (classical, low cervical and vaginal), cauterization of labial tumors and radium insertions, Bartholinectomy and vulvectomy, repair of wound following evisceration.

Certain general rules that have been thoroughly stressed previously by Farr will bear repeating, as we have found them to be absolutely correct by experience.

1. The patient must be made as comfortable as possible on the table before starting the operation.

2. Plenty of novocaine must be used for infiltration of the subcutaneous tissues, rectus sheath and peritoneum. In so doing there is no danger if the point of the needle is kept moving while injecting.

3. A tactful and skillful anesthetist who understands the procedure is of great assistance in allaying the fears of the nervous patient.

4. The greatest gentleness in all movements and in handling retractors, forceps, ligatures, etc.

5. Most of the operating must be done with the organs in situ. The elevation of structures, with the consequent traction on unanesthetized fields, is disastrous.

The material upon which these observations were based is more significant for the variety of operative procedures done than for the numbers of individual operations. However, we feel that enough has been done to determine the applicability of local anesthesia in these procedures. We have listed the operative procedures separately but it must be understood that more than one procedure usually was carried out during the operation. Thus, some of the patients had a dilatation and curettage, amputation of the cervix, anterior colporrhaphy, peri-

neorrhaphy and ventrofixation. There were in all 54 major procedures so designated because of the opening of the peritoneal cavity, and 88 minor procedures, in addition to 34 in which simply a dilatation and curettage was done.

| MAJOR | |
|---------------------------------|-------|
| Supracervical panhysterectomies | 11 |
| Ovarian cysts | 8 |
| Ventrofixations | 7 |
| Appendectomies | 3 |
| Gilliam suspension | 1 |
| Low cervical cesarean sections | 2 |
| Classical cesarean sections | 3 |
| Vaginal cesarean section | 1 |
| Eviscerations | 3 |
| Interpositions | 7 |
| Ectopic pregnancies | 4 |
| Salpingectomies | 2 |
| Myomectomies | 2 |
| | <hr/> |
| | 54 |
| MINOR | |
| Perineorrhaphies | 20 |
| Trachelorrhaphies | 10 |
| Anterior colporrhaphies | 10 |
| Episiotomies | 30 |
| Third degree lacerations | 2 |
| Vaginal fistula | 1 |
| Bartholinectomies | 5 |
| Cauterization of vulva | 1 |
| Vulvectomies | 4 |
| Cervical amputations | 5 |
| | <hr/> |
| | 88 |

These operations were done with no general anesthetic except in the case of one of the hysterectomies, in which because of very dense adhesions and marked adnexal pathology so much traction was necessary that vomiting was induced. This led to protrusion of some of the bowels through the abdominal wound which caused so much pain due to traction in the mesentery that it was necessary to relieve the pain by general anesthesia to complete the operation. There has been no mortality in this series and no evidence of acute novocaine poisoning.

TECHNIC

Episiotomy has best been done by direct injection of the line of incision without attempting to block the pudic nerve as it emerges under the ramus of the pubis near the tuberosity. We have delayed making the infiltration until the perineum is bulging and a portion of the scalp, larger than a dollar, is showing. Usually when the injection is made at this time and about five minutes allowed to elapse between the time of injection and incision, sufficient anesthesia is produced to allow for repair even if the remainder of the second stage and the third stage take as much as three-quarters of an hour. Occasionally a small amount of novocaine is injected subcutaneously during the repair if the tissues seem at all sensitive. The healing has not been disturbed in any way.

For the ordinary perineorrhaphy we use a combination of local infiltration and nerve block. With a fine needle we raise a wheal just above the tuberosity of the

ischium and through this with a longer needle we search for the inner border of the pubis just above the tuberosity. From here downward for about two inches we inject about 10 c.c. of novocaine on each side. From the same puncture we infiltrate locally another 10 c.c. in the region of the fourchet and lower half of the labium. We then infiltrate between the vagina and rectum underneath the posterior vaginal wall extending upward about two inches from the introitus. We allow the novocaine to act for about three minutes before opening the mucocutaneous junction. We find the separation of the vaginal and rectal walls is not painful, the levator muscles are easy to identify and the suture of the levator muscles and the urogenital septum is accomplished easily without pain, as is also the removal of the redundancy of the vaginal mucosa.

For dilatation and curettage we place a tenaculum on the anterior lip of the cervix and inject about 7 c.c. of novocaine solution on each side of the cervix from one inch to two inches above the vaginal vault into the base of the broad ligament. The dilatation of the os in most cases is then easily accomplished without undue pain. We have found, however, on several occasions that the endometrium is sensitive as shown by the reaction of the patient when the dilators were introduced into the uterine cavity and especially when curettage was being done. However, the degree of pain is never sufficient to necessitate the addition of general anesthesia. In certain sensitive individuals it is necessary to infiltrate the perineum and the lower vagina to allow for the comfortable introduction of a weighted speculum.

For anterior colporrhaphy and the repair of cervix the infiltration is carried out the same as for dilatation and curettage. In addition to this the needle is introduced beneath the anterior vaginal wall between it and the bladder and the tissues thoroughly infiltrated. This helps to separate the vagina from the bladder. Infiltration under the bladder is made before separating the bladder from the uterus. Supplementary injections into the parametrium after it is exposed are made when necessary. These injections and manipulations can be easily carried out without any apparent pain to the patient. There is some obscuring of the planes of cleavage noted when a large amount of the solution is injected which may interfere some, although not seriously, with the identification of structures.

For the interposition operation the same technic is employed as for anterior colporrhaphy. In addition the vesicouterine fold is exposed behind the bladder and injected before being incised. The visceral peritoneum of the anterior uterine wall is infiltrated before being grasped by the Allis forceps to bring the fundus forward. The traction necessary in this step of the operation nearly always causes some pain complaint. By injecting the uterine end of the round ligaments and the upper part of the broad ligaments the tubal section can be carried out for sterilization when necessary. The anterior vaginal wall covers the fundus without difficulty.

For opening the abdomen the following steps have been used: Thorough infiltration of the subcutaneous tissues for a distance of about three inches on each side of the midline. Particular attention has to be paid to the lower three inches of the incision near the pubis as it is much harder to get a good block here. The rectus sheath is then thoroughly infiltrated on each side by several injections made by puncturing the sheath along the wound and injecting about 3 c.c. of solution at each point. The sheath is then opened and the muscles separated by sharp dissection if necessary. The peritoneum is next thoroughly infiltrated in the midline and also a few inches on each side, special attention being given to that portion of the peritoneum which will come in contact with the mechanical retractor when the latter is in place. We have recently supplemented these injections by injecting subperitoneally from the abdominal side especially in the region when the retractors are to be spread. The bowels are gently crowded into the upper abdomen by wet lap pads and the pelvic viscera are carefully inspected or gently palpated to determine the number and extent of adhesions present. The fundus of the uterus is infiltrated if

it is desired to grasp it with a tenaculum. It can then be raised gently, and the broad, infundibulopelvic and round ligaments thoroughly infiltrated using a fine needle. The cervical region anteriorly and posteriorly can then be injected after which considerable traction can be made on the uterus with comparatively little pain to the patient. Ventrofixation can now be easily carried out. Baldy-Webster or Gilliam suspension, salpingectomy, defundectomy, ovariectomy can be equally well done. When there are adhesions between the uterus or adnexa and the broad ligament or pelvic walls it becomes necessary to infiltrate the areas of attachment, and separate by sharp dissection with the minimum of traction.

Oophorectomy for a large cyst has been easily accomplished in those cases in which the cyst was pedunculated and not too adherent. The abdomen was opened in the usual way, the cyst partially emptied of its contents by trocar, then gently lifted out of the abdomen and the pedicle, thoroughly infiltrated and clamped. The cyst was then removed and the pedicle ligated. For those cases complicated by adherent loops of bowels, infiltration of the adhesions and sharp dissection has resulted in freeing these adhesions with practically no discomfort. Slightly more difficulty has been encountered with the intraligamentary type of cyst. In these cases, however, if the broad ligament is carefully infiltrated it is surprising how much dissection can be carried out with the minimum of pain if one infiltrates as he proceeds and avoids undue traction.

For exposing and removing the appendix through a midline incision we have found it best to use the Jackson retractors. We lift up the cecum gently as far as its normal mobility will permit and infiltrate the mesentery of the appendix before clamping and tying the same. We have not found it necessary to inject the peritoneum of the cecum to insert the purse-string suture. The excision and inversion of the stump are easily done without causing pain.

We have had two opportunities to use the local infiltration in the repair of evisceration wounds neither of which occurred following primary laparotomy under local anesthesia. Infiltrating on each side of the wounds subcutaneously and into the peritoneum close to the edges of the wound has been sufficient to allow for repair without general anesthesia. The difficulty here has been the keeping of the bowels in the abdomen while approximating the edge of the peritoneum. Wound healing occurred uneventfully in both cases.

DIFFICULTIES ENCOUNTERED

These may be divided into psychical and physical. Under the former we may place those patients who approach the operation in a state of terror at the thought of an operation without general anesthesia or in whom the premedication is withheld or does not have the proper sedative action. These patients react violently to the preliminary hypodermic injections and to every sensation of pressure whether or not they feel pain. If the work to be done in the abdomen is at all extensive, these patients had best be given a general anesthetic. Failure of the anesthetist to properly reassure and distract the attention of the patient may lead to failure of the method. The surgeon and his assistants must constantly realize the limits of the field of anesthesia and that everything outside the blocked area must not be touched. That all movements must be made gently and deliberately. The method is time-consuming and demands the greatest amount of pa-

tience. Procedures that can ordinarily be carried out easily and swiftly take time and are often difficult to accomplish under the imposed restrictions.

The physical difficulties are numerous, but as a rule not insurmountable. We have found that exposure as a rule is not as easy to obtain due to two factors: First the abdominal retractor cannot be spread quite so widely as under general anesthesia, and second the bowel cannot be held back in the upper abdomen by laparotomy pads quite so well. Much of the work has to be carried on deep in the abdomen, especially where there are many adhesions, to avoid the discomfort due to traction on the peritoneum of the culdesac or side walls of the pelvis. Large fibroids especially on the anterior wall interfering with access to the broad and infundibulopelvic ligaments increase the difficulty of injecting these structures. Marked adnexal pathology complicating large fibroids especially with omental and intestinal adhesions have offered insurmountable difficulties in some cases. Access to the adherent adnexa to permit of infiltration of the area of attachment has given trouble at times. Whenever possible, adhesions have been carefully divided by sharp dissection under the eye. Bleeding in a given case may interfere with this procedure. When bleeding occurs either from raw surfaces or from a vessel that has escaped from a suture or forceps it is not so easily controlled as under general anesthesia since hot pack, pressure, forceful retraction and clamping are limited in their applicability. If great caution is not observed vomiting and retching will occur which frequently results in so much pain that general anesthesia has to be resorted to. However, this can be accomplished with a minimum of gas and even this can be dispensed with before the end of the operation in many cases.

It is estimated that it takes about one-fourth to one-half longer to do the work under local anesthesia. Plastic work is also slower because of the necessity of supplementary injections from time to time, and the care with which we proceed to insure staying within the anesthetized area. Idiosyncrasies to the premedication or to novocaine are a potential source of danger although none of our patients have shown this complication. We incise the abdominal wall soon after injection and hence much of the injected fluid runs out. The greatest danger is that a considerable amount of the fluid might be injected intravenously. This can be entirely avoided if one keeps the point of the needle moving while injecting. We have had trouble with wound healing in two cases. One a third degree tear which had previously refused to heal following attempted repair under general anesthesia. Our secondary repair attempt under local infiltration resulted in a healing of the muscle sutures with good functional result but the skin and urogenital septum did not heal. The edges were freshened under general anesthesia and closed again with silkworm-gut and

again failed to heal. In another case we noted a cellulitis about 5 or 6 cm. from the wound margin and extending around into the flank. The wound, however, did not break down in this case even though the patient produced a severe second degree burn by the use of a hot water bottle.

ADVANTAGES OF THE METHOD

There is apparently no danger to the method except that of novocaine poisoning in case a considerable amount of the solution should be injected into the blood stream, or more than 300 c.c. be necessary for the infiltration. No evidence of a toxic reaction occurred in our cases.

There is no shock to those patients as evidenced by fall in blood pressure, rapid pulse and the usual evidences of this complication.

There is no reason to hurry during the operation because of the possible toxic effect of the anesthetic on the general condition of the patient.

There is much less afterpain, vomiting, retching, and the toxic effect of the general anesthetics on the parenchymatous organs as the liver and kidney is entirely eliminated reducing postoperation acidosis.

Fluids by mouth can be tolerated earlier and bowel peristalsis comes back quicker than in similar operations than when done under general anesthesia.

The ever-present danger of bronchopneumonia due either to the irritation of the anesthetic agent itself or to aspiration of vomited material is eliminated. It is of course well known that this complication may follow local anesthetics.

The conscious patient can cooperate better in the postoperative management and can give valuable information regarding subjective symptoms in case of complications. This advantage is somewhat offset by the fact that some of these patients remain drowsy from the premedication about as long as if they had had ether and much longer than patients who have had gas or ethylene. There is no danger of explosion or sudden death from asphyxia as may follow ethylene or nitrous oxide.

The reaction of the patient to the whole procedure is of interest. Those not having premedication are quite apprehensive and nervous about the procedure. They react less favorably to the preliminary infiltration and complain more during operation and remember the operation as an ordeal. The cases having proper premedication, however, stand the infiltration and operation much better, and even when they complain at times have no unpleasant memories of the operation. Those who do complain of the operation refer not so much of the actual pain as of hearing the instruments and the consciousness of the whole procedure.

The following case reports illustrate some of the points which have been made in the preceding pages.

CASE 1.—A thirty-seven-year-old para vii, with a severe nephritic toxemia, a bronchial asthma, and a six months' pregnancy. Blood pressure 260/150. A vaginal cesarean section was done. During the operation the blood pressure dropped from 260 to 200, the pulse from 152 to 140 and the respirations from 32 to 20. She slept throughout the operation which was rather difficult because the cervix could not be brought down to the introitus. There was no evidence of shock postoperatively, and she made an uneventful recovery. The operating time was sixty-three minutes.

CASE 2.—A thirty-four-year-old white woman with a large ovarian cyst. The tumor was tapped before removal and 2060 c.c. of fluid removed. During the removal the systolic pressure fell from 120 to 100 and the diastolic pressure from 80 to 70. The pulse fell from 80 to 70 and then rose up to 100 while the cyst was being removed, and the operation ended in forty minutes with a systolic pressure of 100, diastolic of 70 and a pulse of 90. The patient was cooperative only showing a brief period of moving and talking.

CASE 3.—A supracervical panhysterectomy was done. Operating time one hour and fifteen minutes. The systolic pressure dropped from 145 to 115 and returned to 130. The diastolic pressure remained 70 throughout. The pulse was 110 at the start of the operation and steadily reduced to 90. Respirations decreased from 32 to 26. Vomited twice and noisy at times.

CASE 4.—A twenty-eight-year-old white woman with a marked mitral stenosis and beginning pulmonary edema and a systolic blood pressure of 145 was in the hospital for two months because of cardiac decompensation. Classical cesarean section was done near term in Fowler's position because of dyspnea. Operating time was fifty-two minutes. Operation was started with systolic pressure of 145 and ended with systolic pressure of 110 and the diastolic pressure ranged from 100 down to 70. The pulse varied from 110 at the start of the operation to 72 at the end. She complained of some pain on delivery of baby and on sponging the lower angle of the wound. One-fourth grain of morphine was given hypodermically as soon as the baby was delivered. Convalescence was uneventful.

CASE 5.—A forty-eight-year-old white woman had a supracervical panhysterectomy for fibroid uterus. The operating time was one hour and thirty-five minutes. The blood pressure was 138/90 at the start of the operation and 124/80 at the end. The pulse was 110 at the beginning of operation and 88 at the finish. There was some pain on delivery of the tumor and some irrational talking throughout but practically no memory of pain the next day. Recovery was uneventful.

CONCLUSIONS

1. Nearly every gynecologic operation can be done under local anesthesia reenforced by scopolamine and morphine.

2. It is not the anesthesia of choice in uncomplicated cases because of the difficulties mentioned above.

3. It is the method of choice in certain carefully selected complicated cases because of the advantages mentioned above.

4. The operator must be prepared to spend more time and patience in this type of operating and deftness and gentleness in handling tissues are of paramount importance.

5. Major abdominal operative procedures should not be attempted by the unskilled surgeon since complications may occur that will try the skill of an experienced surgeon.

6. Facilities for switching to general anesthesia should be available as well as the assistance of a trained anesthetist who cooperates in the management.

7. A combination of nerve block and local infiltration is advisable in most of the work, especially the abdominal work.

8. Premedication with scopolamine and morphine is a very valuable adjunct.

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30 NORTH MICHIGAN AVENUE.

(For discussion, see page 427.)

Fruhinsholz, A.: Operative Indications in the Presence of Lutein Cysts Associated with Hydatid Mole. Gynec. et Obst. 18: 193, 1928.

The author reports two cases bearing on the disputed question of the pathogenic significance of lutein cysts developed coincident with hydatidiform mole. His first patient was one in whom large cysts, one of them the size of a fetal head, were present coincident with a hydatid mole. These persisted for several weeks together with signs of mild infection and subinvolution and regressed and disappeared finally after a curettage. A normal pregnancy followed. A second patient, with a uterus of size of about three months, showed two ovarian cysts approximately the size of small oranges. Débris from the uterus gave the diagnosis of hydatidiform mole. Two weeks later a curettage was done and there followed a definite reduction in the size of the cysts. Two months later the patient was menstruating normally and the ovaries had returned to approximately normal size. The author concludes that it is not necessary to operate from above for hydatidiform mole associated with large ovarian cysts, not even when larger cysts persist as long as two and a half months after the expulsion of a mole though there might be a suspicious uterine discharge. These findings may simply indicate a mild infection with subinvolution. In the latter case a curettage may effect uterine regression with secondary ovarian involution. The clinical finding of bilateral ovarian cysts with a uterus enlarged in size together with menstrual troubles should suggest the possibility of the existence of a mole even in the absence of microscopic findings.

GOODRICH C. SCHAUFFLER.

Bauer, A. W.: The Influence of Acid Diet and Akali Diet on the Self-cleansing of the Vagina. Med. Klin. 39: 1506, 1929.

The author succeeded in curing leucorrheal discharge by prescribing raw foods and foods rich in vitamins such as fruit, nuts, salad, vegetables, raw milk, and sauer kraut. He also cured nonspecific vaginal discharges in children by the administration of vigantol. Before prescribing the special diets for his patients, Bauer had lived on a vitamin-rich, meat-poor, salt-poor and alkali-rich diet, and had felt better than for many years.

J. P. GREENHILL.

THE VARIABILITY OF MENSTRUAL RHYTHM AND CHARACTER

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✓
IT HAS been more or less accepted that the normal menstrual rhythm is a monthly cycle with very little variation in time interval, duration, and amount. Alterations from the set cycle have been accepted as indicating a pathologic condition. The careful histologic studies of Hitschmann and Adler have shown that the uterine mucous membrane undergoes definite cyclic changes, and in more recent times Schroeder, Meyer and others have correlated these uterine stages with corresponding cyclic processes in the ovary. More recently Frank and his coworkers have shown that in the blood there is a definite cycle paralleling the ovarian and uterine one. All of these correlated cycles, ovarian, blood, and uterine, may show variations that are classified as normal. It has been demonstrated that approximately between 8 and 14 days after the last period the mature follicle ruptures, to be followed in a certain specific time by the appearance of the menses, provided the ovum has not been fertilized. While we have realized that individual variations in the menstrual periods take place, and that periods with a time interval of 24 to 32 days have been considered normal, we have accepted the fact that the type for each individual was more or less fixed. ✓
Sanes (Am. J. Obst. Diseases of Women and Children, 1916, Vol. 73, p. 93) has studied this problem of periodicity and states that 77 per cent of women have regular periods. If there was an irregularity noticed, it was of one or two days either way. He has also noticed that even if patients have menstruated as long as 4 days regularly, a temporary period of amenorrhea may supervene. He has also noted some irregularity in duration, but finds 3 days the most common type. He mentions the fact that during a period, one or two days may occur without any bloody discharge followed by one or two additional menstrual days. The common type he finds is the 28 day period with a duration of 3 days. When there is an irregularity the tendency is for the period to be prolonged, and he concludes that 75 per cent of women menstruate, as he terms it, regularly. ✓

✓
I have made a careful study of 200 cases, ascertaining with great detail the exact days of each menstrual period for the entire year. These cases were not actually ill, nor were they suffering from uterine or ovarian neoplasms or disease. ✓ They represented women who were under observation for such conditions as cystoectocoele or retroversion; women without gynecologic disease, who simply reported for a check-up on the menstrual type; a group of postoperative cases whose clinical histories

before operation were apparently normal as far as gynecologic disease was concerned; and a small group of female workers without any physical disturbance.

VARIATIONS IN INTERVAL

✓ The most striking find was the fact that the menstrual period did not recur regularly on any specific day. ✓ In other words, the patient who stated that her period always occurs on a specific day in the month, when closely questioned and when required to keep an accurate written report, was noted to be in error. ✓ In a very few instances the periods occurred on the twenty-eighth day for 9 of the 12 months. In most instances, however, there were variations in the appearance of the first menstrual discharge that varied from 5 days before the accepted time to 10 days after, and this variation occurred almost as frequently as would the so-called normal cycle. In 12 instances periods were skipped for an entire month with no definite reason except in 2 cases where psychic trauma, in one case, death in the family, in another, an automobile accident, may have contributed. The following periods were normal in character and duration. ✕ In neither of these two cases was it possible to obtain tissue for examination, so that the possibility of an early abortion cannot definitely be excluded, but the history makes it seem very unlikely. ✓ In two instances two monthly periods were skipped in two separate individuals. In both of these cases the return of the menses, after the two-month period of amenorrhea, was normal in character and duration. A small group gave a history, and their records bore this out, of periods whose onset was every 18 to 23 days with one- or two-day variations either way. In other cases for 6 or 7 months of the year the onset of the period was marked by extreme irregularity, varying from 28 to 40 days, and then suddenly for the rest of the year a so-called normal 28 day cycle. ✓

VARIATIONS IN DURATION

In addition to the marked variations in the menstrual interval, it was also noticed that there was a distinct, though not so marked, ✓ variation in the duration of the flow. ✓ In 115 of the 200 cases the periods for the entire year lasted exactly 4 days; in 50 for 5 days; in 18 for 6 days; in 9 for 7 days; in 3 for 8 days; and in 4 for 12 hours. In a number of cases where the period lasted 4 days, a single period during the year would last but for 3 days or occasionally extend to 5 days. In the cases that normally lasted 5 days there were several instances where the duration was only 4 days for one, two, or even three periods in the year, and an occasional period that lasted 6 days. This same variation was noted in those cases where 6 days was the accepted normal duration. It was observed in addition that not only did the duration of the period vary from one-half day to 8 days, this variation being grouped as normal, but that in the same individual the periods might present slightly dif-

ferent aspects not only as previously mentioned as to interval, but also as to duration. In several instances those women who menstruated but a half day for nine periods, would menstruate sometimes for 24 hours and occasionally for only 1 hour for the other 3 periods. Those women who had very short periods showed little variation in the type, and each recurrent menses would be approximately of the same duration and same character as the preceding one—a variation of one day one way or the other occasionally being observed. Those that were classed in the normal group of 4 to 5 days likewise showed only slight variations either in onset, duration, or character, usually 24 hours' prolongation or curtailment being the greatest variation.

VARIATIONS IN MODE OF ONSET AND INTENSITY

The mode of onset and intensity of a period also presented differences. In those women whose periods were 4 days, the usual history obtained was that the period began with slight spotting for 24 hours, and then became moderately profuse for 24 to 36 hours with a gradual cessation. The spotting stage necessitated only one napkin for 24 hours, and that merely as a precautionary measure; during the more profuse stage 4 to 8 napkins per day were necessary, this being controlled by the personal habits of the patient. In those periods lasting over 4 days the flow would also begin with a slight staining for 24 hours, the second and third day of the period being more profuse, with a gradual tapering off for the next few days. In those women whose periods were of longer duration than 4 days the flow was usually described as very profuse for at least 3 of the days of menstruation, the women often being confined to home or bed for 24 or 48 hours. This period of confinement was the second or third twenty-four hours of the period. Usually in those women whose periods were of long duration the onset would be described as a brownish discharge for 2 or 3 days, with a profuse and often painful flow for the next 2 or 3 days. The pain, too, at times was sufficient to confine the patient to bed. After the subsidence of the profuse flow another 72 hours of gradual diminishing discharge was noted.

The character of the onset also varied irrespective of the interval or duration. In most instances the onset of the period was described as dark brownish stains. In a small number of cases it was noted to be light blood-streaked mucus, and in another group a bright red spotting. The character then changed to the dark unclotted thick blood which persisted for the duration of the heavy flow and gradually subsided until its final disappearance. In a few instances where this was the accepted character of the flow, it was noted that the period stopped abruptly instead of being a gradual cessation. When this occurred the total duration of that period was observed to be from 24 to 48 hours less than the accepted normal for that individual. In many

instances the onset was described as a moderate staining for 2 days with complete cessation for one day, then the sudden appearance of more or less profuse bleeding persisting for 2 or 3 days, and a gradual disappearance. Again in a number of women the mode of cessation varied. In some there was a gradual diminution of the flow to complete disappearance, in others an abrupt stoppage at what seemed the height of the flow, and in a third group the flow would apparently cease, to reappear after 24 or 48 hours. In this latter type the re-appearance of the discharge, which was usually slight, added a day or two to what the women considered their normal duration. This latter type was often accounted for by the patient as due to some physical exertion or to the taking of a bath. The character of the flow we have seen varies somewhat in individuals and in individual periods for the same woman.

Clots were described as being passed in 28 cases, in 20 of them without pain, in 4 with slight pain, and in 4 with great pain. The histologic examination of these clots showed blood leucocytes, desquamated vaginal epithelium, and varied sized fragments of uterine mucosa. The size of these fragments bore no relation to the degree of pain.

✓ It would seem from these observations that there is a wide range of variability in the actual concept of the normal menstrual function. These variations may be dependent on different factors. The following deductions are, however, purely hypothetical.

1. A difference in the rate of production of the ovarian hormone, or hormones.
2. A difference in the concentration of the hormones.
3. A variation in the rate of excretion of the hormones.
4. The variable susceptibility of the individual to the hormones; or
5. A variation in the synergistic or antagonistic activity of the hormones.

100 EAST SEVENTY-FOURTH STREET.

Herrman, E.: Rupture of Ovarian Tumors. *Wien. klin. Wchnschr.* 42: 1350, 1929.

This is a case report of rupture of a dermoid ovarian cyst following a fall in a 57-year-old woman. The cyst contents localized not in the pelvis but about the umbilicus. The literature on the subject is reviewed.

FRANK SPIELMAN.

CONGENITAL DEFECTS OF THE DIAPHRAGM WITH RELATION TO ASPHYXIA NEONATORUM

REPORT OF TWO CASES

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IN STANDARD textbooks of obstetrics, there is seldom any reference to congenital defects of the diaphragm as a cause of asphyxia with atelectasis pulmonum in the newborn. Numerous isolated case reports may be found in the literature, most of them erroneously labelled "congenital diaphragmatic hernia."

A study of the findings at autopsy in all of the cases which we reviewed shows that they are not a true herniation through the diaphragm, but a partial or complete absence of one or both sides of the diaphragm with the hiatus pleuroperitonealis remaining and with variable proportions of the normal abdominal contents occupying the chest cavity. Associated with this is a corresponding displacement of the thoracic structures. The heart and lungs are displaced to the side opposite the bulk of the invading abdominal organs. There is also a marked lack of development of one or both lungs, a significant point with regard to any proposed surgical treatment.

LeWald, in an excellent article on congenital absence of the left half of the diaphragm, differentiates this condition from eventration of the diaphragm, thoracic stomach, and diaphragmatic hernia. Included in his article is a brief description by Hume of the development of the diaphragm.

The first case to come under the personal observation of one of the authors (C. S. H.) was at the Brooklyn Hospital, Brooklyn, New York. The mother appeared normal in every respect and for a primipara had an unusually easy, spontaneous delivery. The child breathed and cried promptly. No particular effort at resuscitation was necessary, and no abnormal condition was suspected. The position of the apex beat was not noted at the time. The second day after delivery there were several mild cyanotic attacks. Consultation with the physicians of the pediatric service elicited no definite diagnosis or suggestion with regard to treatment. On the third day, the cyanotic attacks increased in frequency and severity and resulted in death. Postmortem examination revealed a partial absence of the posterolateral portion of the left side of the diaphragm; the chest cavity was occupied by all of the abdominal contents except the liver, stomach, spleen, a few inches of the upper small bowel and the descending portion of the large bowel.

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Both lungs were decidedly lacking in development, particularly the left one, which was completely atelectatic. There was moderate air content in the right lung. The heart was displaced to the right of the midline. The posterior parietal peritoneum was continuous with the parietal pleura and the posterior margin of the narrow left diaphragm was smooth. The real condition was not even considered prior to death; the diagnosis was made at autopsy. Both the physicians of the

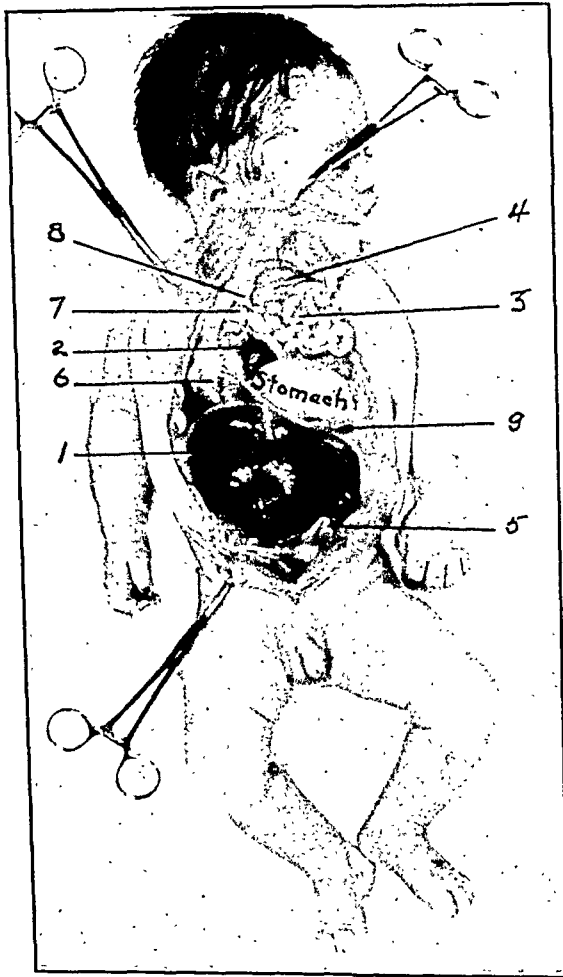


Fig. 1.—1, liver; 2, spleen; 3, small intestine; 4, large intestine; 5, sigmoid; 6, heart; 7, right lung; 8, left lung; 9, anterior border diaphragm.

pediatric service and the baby's parents were of the opinion that the infant had been injured in some way during the delivery. This impression could not have been dispelled without postmortem examination. (Figs. 1, 2, 3.)

CASE 2.—This mother was a secundipara. Her first child, aged seven years, was in good health at the time of birth of the second baby. Labor was uneventful, easy and spontaneous. The infant was normal in general appearance and weighed eight pounds. Resuscitation was slow, but

the heart tones were of good quality. The apex beat was located in the midline. The appearance and behavior of the baby were very much the same as of one with a moderate degree of morphine-scopolamine narcosis, and as the mother had received one-sixth of a grain of morphine and one two-hundredth of scopolamine about three hours prior to delivery, the delay in resuscitation was attributed to this and very little attention given to the position of the apex beat at the moment. In about ten



Fig. 2.—1, Persistent hiatus pleuroperitonealis; 2, rounded posterior edge of diaphragm brought forward.

minutes fairly regular respirations were established, the baby's color improved, but the respirations continued to be abdominal in type, with very slight expansion of the chest. After having cleared the air passages, gentle mouth to mouth insufflation had been tried with no benefit. Oxygen was continuously supplied from the tank and seemed to be the most effective means of maintaining the color.

The child was taken to the nursery, where administration of oxygen was continued, and for about an hour the color remained fairly good.

Then severe cyanotic spells were noted, occurring at intervals of fifteen minutes. Each time they were relieved by administering oxygen for a few minutes. After five hours the cyanosis became persistent and respirations were irregular and at long intervals. The heart action remained good, but respirations finally ceased about seven hours after delivery. During this time it was noted that the apex beat and heart sounds were well over to the right of the midline, that the chest was



Fig. 3.—Thorax with abdominal contents restored to peritoneal cavity: 1, hiatus; 2, right lung; 3, left lung.

quite tympanitic over the left side, less so over the right side, and that the breath sounds were harsh and transmitted loudly throughout the entire chest. Pediatric consultation had confirmed our physical findings. The possibility of a congenital diaphragmatic defect was considered, largely because of experience with the first case described, but the grave condition of the baby during its entire period of life precluded any x-ray examination.

Postmortem examination revealed a condition entirely incompatible with continued existence. The peritoneal cavity contained nothing but a large liver, the first portion of the stomach, and the length of large bowel necessary to reach the anus. The posterolateral portion of the diaphragm was incomplete, with persistence of the hiatus pleuro-peritonealis leaving an opening 3 x 2 cm. The parietal peritoneum was continuous with the parietal pleura and the posterior margin of the incomplete band of diaphragm was smooth.

The anterior chest wall was removed and the colon, entire small bowel, stomach and spleen were found to occupy about four-fifths of the thoracic cavity. The small bowel occupied both apices of the chest. The left lung was about .5 x 1 x 2 cm. and completely collapsed. The right lung was about twice as large and contained air. Both were just above the heart and crowded against the posterior thoracic wall. The heart appeared normal in size and structure. The thymus was normal in size. With gentle traction the abdominal contents could very readily be replaced in the abdomen in their normal arrangement.

Both of these cases represent the same type of congenital defect in the formation of the diaphragm, differing chiefly in the amount of abdominal content found in the thorax. The symptoms and length of life are in proportion to the degree of abnormality.

The case reports studied in the literature are of a similar nature, varying only in the extent of the defect. They may be briefly summarized as follows:

Fernandez, of Buenos Aires, reports two cases. One infant survived only thirty minutes. The other infant at the age of three months, showed marked cyanosis during the nursing period, a significant feature with regard to methods of resuscitation which may be wisely employed. Diagnosis was determined by roentgenograms in both cases. Reports of postmortem examinations are not given in detail.

Dunne reports one stillbirth. The diagnosis was established at postmortem examination. Autopsies are urged on all stillbirths in order to avoid unjust criticism of the management of labor.

Williams also reports a stillbirth with futile attempts at resuscitation. In this infant the right lobe of the liver and the gall bladder as well as the other abdominal organs were in the thorax, the diaphragm defective on both sides, and the lungs very small.

Waldron reports "an additional case to the many now in the literature" in which the infant survived fifteen minutes. There was marked lack of development of the lungs and extrusion of all of the abdominal contents with the exception of the liver. The possibility of surgery was considered but not attempted in this instance. Connors and Robinson report the case of a young woman as congenital diaphragmatic hernia. A series of 245 cases of diaphragmatic hernia in adults was reported by Leichtenstern. In the cases noted, very few were congenital, the majority were traumatic in origin. In view of the high fetal mortality from this condition, one would expect to see very few adult cases of congenital origin.

Lull reports a case with marked congenital defect of each side of the diaphragm, resulting in almost a complete absence of that structure. No respirations were established, although the heart beat for fifty-five minutes. The lungs were very small and undeveloped. Methods of resuscitation used in this infant were "the

administration of carbon dioxide, with alpha-lobeline and atropine injections, which were of no avail. Artificial respirations were instituted and after a short time the more vigorous methods of resuscitation were resorted to."

The condition under discussion is, perhaps, a more common cause of asphyxia neonatorum than one is led to believe by the relative infrequency of case reports. Many more such reports probably could be added to the literature if physicians would more frequently insist on

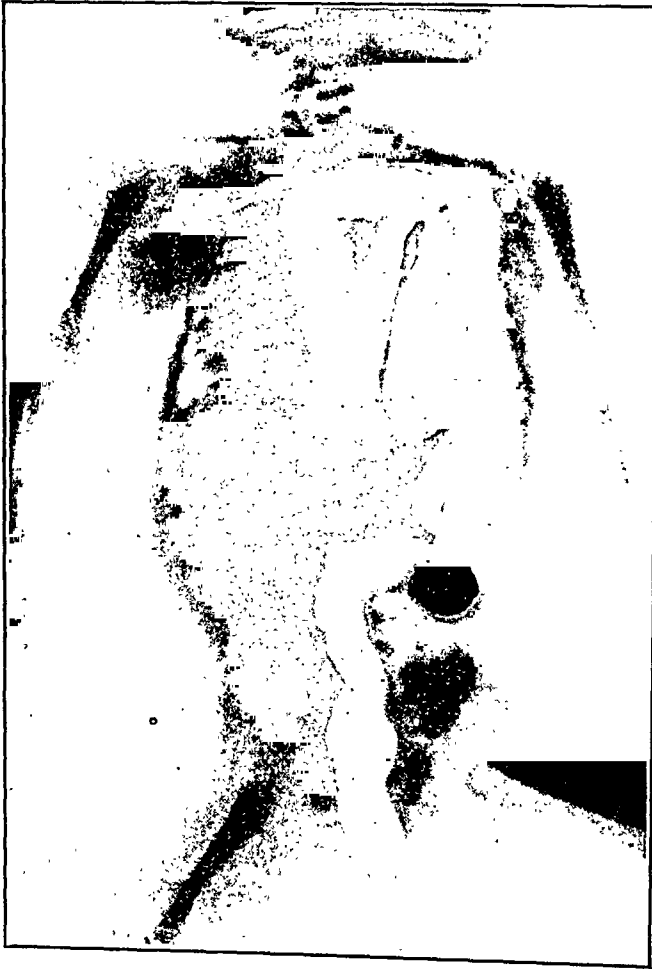


Fig. 4.—Injection of opaque media through the rectum (postmortem).

postmortem examinations, especially in cases in which the cause of death is not obvious from the physical examination. For diagnosis prior to death, the first essential is to have the condition in mind in all cases of persistent or recurrent asphyxia, especially when the delivery has been accomplished in such a manner that there is no good reason for suspecting trauma. Displacement of the apex beat to an unusual position, either right or left, is very suggestive of the condition, especially when accompanied by atelectasis. If the child should survive for a period of several days, x-ray investigation would serve to confirm the diagnosis.

When permission for autopsy is refused, injection of the gastrointestinal tract from both ends with one of the usual opaque media, followed by roentgenograms, would serve to establish the presence of thoracic invasion by the bowel and to clear the physician from the imputation of being the responsible factor in the death. In our most recent case the house obstetrician and, no doubt, many of the nursing staff, firmly believed that the morphine and scopolamine were the chief factors in the asphyxia. (Figs. 4, 5.)



Fig. 5.—Injection of opaque media through the duodenal tube (postmortem).

Attempts at resuscitation should always be gentle. Some form of intratracheal insufflation under controlled pressure would be most effective. Mouth to mouth insufflation is the most disastrous type to employ as it usually inflates the stomach, thereby increasing the severity of the asphyxia.

No case records could be found in which surgical treatment had been carried out in the newborn, although several of the authors consider the advisability of early restoration of the bowel to the abdominal cavity

and closure of the hiatus pleuroperitonealis. In our second case it would have been feasible from the mechanical standpoint to restore the bowel to the peritoneal cavity and, perhaps, close the hiatus, but in view of the marked lack of development of the lungs, it is felt that any such procedure would have been without value. Therefore, unless the child shows ability to survive and at least hold its own for several weeks, as in the case reported by Fernandez, in which the infant developed cyanosis at the nursing period, surgery is contraindicated. The immediate effect of surgery, unavoidably associated with pneumothorax, in an asphyxiated child would be disastrous.

CONCLUSIONS

1. Congenital diaphragmatic hernia is a misnomer for the condition caused by defective development of the diaphragm in which the hiatus pleuroperitonealis persists, and the abdominal contents invade the thorax.
2. In persistent asphyxia neonatorum, with displacement of the heart, atelectasis due to a congenital diaphragmatic defect is very probable.
3. Controlled intratracheal insufflation is the method of choice in resuscitation, and mouth to mouth insufflation should be avoided.
4. Diagnosis of the condition should be established by x-ray or by autopsy.
5. Surgery is contraindicated as an immediate procedure.

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The author details an unusual type of adenomyoma which apparently has not been previously described in the literature. The tissue was removed from a forty-seven-year-old nullipara who was first curetted because of menorrhagia and metrorrhagia. The uterine scrapings were characteristic of uterine adenomyoma but were also suspicious as being carcinomatous. An abdominal hysterectomy was performed and the uterus found to contain, besides a moderate sized intramural fibroid, a pure adenomyoma growing in intimate contact with the fibroid. This adenomyoma was sharply circumscribed and contained absolutely no stroma. It did, however, show evidences in one or two areas of carcinomatous changes in the cells.

RALPH A. REIS.

IRREGULARITIES OF THE FETAL HEART*

A PHONOCARDIOGRAPHIC STUDY OF THE FETAL HEART SOUNDS FROM THE FIFTH TO EIGHTH MONTHS OF PREGNANCY

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STUDIES of the fetal heart sounds have been made for at least one hundred years; Kennedy in 1830 described certain sounds and murmurs heard over the pregnant uterus which were not synchronous with the maternal heartbeat. Interest in the examination of the fetal heart sounds has never failed to occupy the attention of the clinician in the century which has followed and from time to time, as new methods have been developed for the investigation of the fetal heart, obstetricians have eagerly seized these procedures.

Amplification of the heart sounds and their graphic registration has made possible further study in regard to the heart and its activities. The past decade has seen a tremendous accumulation of information based upon the electrodynamic manifestations of the heartbeat; the electrocardiograph and the polygraph have become instruments which can reveal the smallest changes from normal. Amplification of the heart sounds now carries forward the possibility of examining the heart under conditions not made available to the electrocardiograph. This is especially true in regard to the study of the fetal heart.

Phonocardiograms, which are the graphic records produced by amplification of the heart sounds, were obtained from the fetus in 1926 by Sampson. He was able to demonstrate that the fetal heart sounds could be easily amplified and recorded graphically for subsequent study. Many fetal heart sounds which were heard with difficulty by the various types of stethoscopes can be readily photographed. Congenital murmurs and anomalous cardiovascular changes can be diagnosed before birth by this method. Irregularities of the fetal heart, however, have not been studied by this method and an attempt has been made to present graphically to the obstetrician the various types of irregularities which may be discovered. This paper is concerned with the more common types of fetal arrhythmias.

FREQUENCY OF FETAL HEART IRREGULARITIES

Irregularities of the fetal heart, especially from the fifth to eighth months, are apparently not uncommon. The available literature does

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not, however, record its frequency. A questionnaire sent to 100 obstetricians in the United States whose collective experience probably represented the results of more than 100,000 prenatal examinations, showed that there is apparently no agreement in regard to the frequency and occurrence of the fetal arrhythmias. About one-third of the obstetricians had never heard changes in the rhythm of the fetal heart; one-half of those that answered said that it was very infrequent. The remainder, on the other hand, reported that irregularities of the fetal heart were very common, estimates running as high as from 25 to 33 per cent of all cases examined prenatally.

The reason for the extreme divergence of opinion in men of equally wide experience is probably due to the difficulties frequently encountered in the examination of the fetal heart; most obstetricians are content to establish the mere presence of the fetal heart and do not carry their examination of it further than a few seconds of observation. Other aspects of the prenatal examination naturally are of more interest to them so that detailed and specific information about the character of the fetal heart is not ordinarily made.

In a rather incomplete survey made of the cases coming to the Prenatal Clinics of the Beth David Hospital Dispensary over a period of about one year, irregularities of the fetal heart were discovered in about 9.2 per cent. While this figure cannot be taken as representing the true incidence of fetal arrhythmias, it is suggestive in indicating that the condition may not be an uncommon one. Subsequent study and collective comparison of figures obtained from many such clinics throughout the country will be necessary before any degree of accuracy can be secured in estimating the true frequency of the fetal arrhythmias.

THE FETAL PHONOCARDIOGRAPH AND ITS CLINICAL APPLICATION

Fetal phonocardiographic tracings are photographic records of the fetal heart sounds after they have been converted into electromagnetic waves by radio amplification. The sounds made by the heart in utero are picked up by specially constructed stethoscopes and led to microphones; here the sound waves are transformed into electric impulses which in turn are passed through certain instruments which now change these impulses back to elements of motion. A photographic record of these movements becomes the graphic tracing known as the *fetal phonocardiogram*.

Stripped of its technical details, the apparatus is merely a method of rendering visible to the eye, sounds which are audible to the ear; in addition to this, many sounds not perceived by the human auditory mechanism are readily discovered by this electrical method of amplifying vibrations caused by rhythmic disturbance of air. In Fig. 1 is represented a schematic diagram of the apparatus used for recording

such sound waves; for clinical use a string galvanometer, such as may be found in every electrocardiographic laboratory, is substituted for the glow lamp device which is necessary for the reproduction of synchronized sound moving pictures.

The clinical application of this apparatus for the study of the fetal heart sounds has been reduced to a rather simple procedure requiring

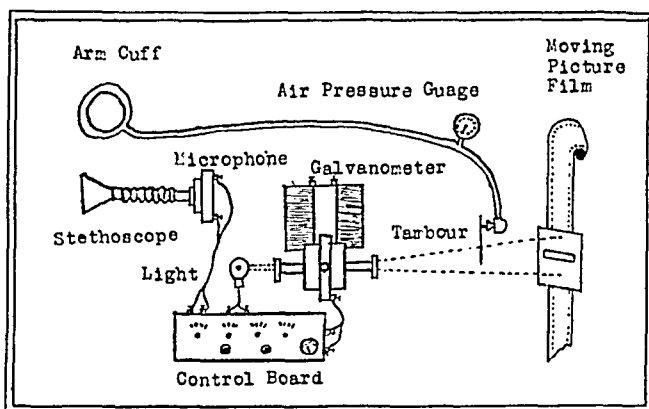


Fig. 1.—Schematic diagram of the fetal phonocardiograph showing how the fetal heart sounds are photographed simultaneously with the maternal pulse beat.

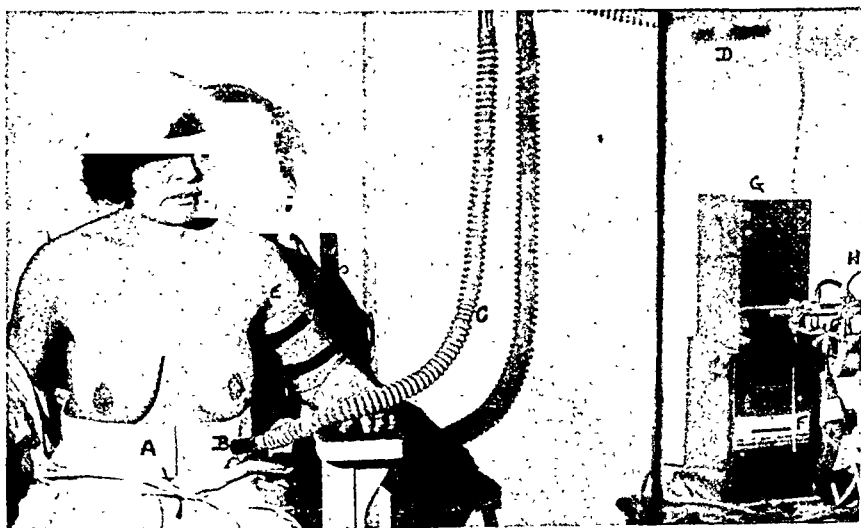


Fig. 2.—Clinical application of the fetal phonocardiograph taken simultaneously with the mother's polygraphic tracing. The important parts of the equipment are as follows: (A) Rubber girdle, (B) stethoscopic receiver, (C) special rubber tubing which carries the sound waves to microphone (D), (E) cuff used to compress mother's brachial artery for recording at tambour (F), (G) moving picture camera, (H) pressure gauge for determining diastolic pressure in polygraphic circuit.

no more than three or four minutes for its entire performance. Details of such an examination are readily seen in Fig. 2; the patient in this case is seen sitting upright in a chair. A wooden stethoscopic receiver is held firmly over the abdomen by a rubber elastic girdle; a large bore, nonexpanding rubber tube conducts the sound waves to the

microphone. From here the electric impulses are led to the galvanometer and the shadow of the oscillating string is recorded by a moving picture camera. A cuff is placed around the mother's arm and after being inflated to diastolic pressure the impulses from her brachial artery are picked up by a mechanical tambour and photographed simultaneously with the oscillations made by the sounds of

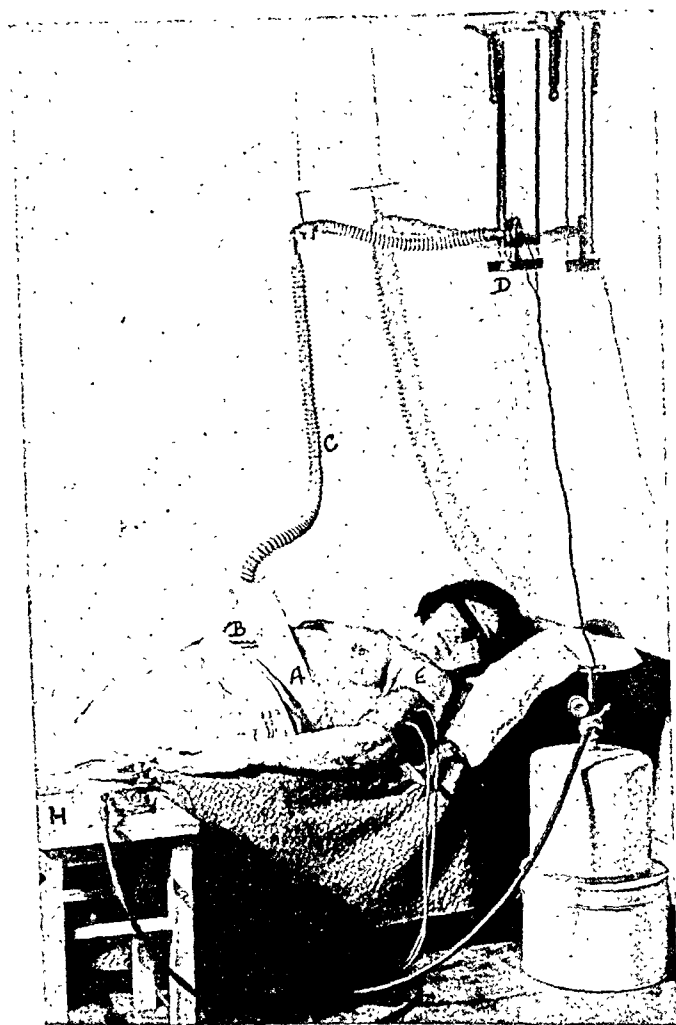


Fig. 3.—Clinical application of the fetal phonocardiogram with the mother in the reclining position. The explanatory letters in this figure are the same as in Fig. 2.

the fetal heart. In this way, simultaneous studies of the maternal and fetal circulations can be made; we shall have occasion to consider this more fully at a later time. Occasionally in very obese patients the fetal heart sounds are more readily picked up and amplified when the mother is lying upon her back. Fig. 3 shows the various parts of the equipment in somewhat greater detail; in this case a large collecting stethoscope covers a great part of the abdomen and fetal phonocardio-

grams can be made even when no heart sounds of any kind can be heard by the ordinary methods of auscultation.

Other noises and sounds that rise within the abdomen are filtered out by balanced electric circuits so that only the sounds made by the fetal heart itself are taken. Intestinal as well as uterine and fetal movements are also eliminated from the tracings; ordinarily this is accomplished without great difficulty but occasionally certain sounds may approach the frequencies made by the fetal heart and when this occurs they may render the study of the records somewhat confusing. In general, however, the rhythmic beating of the fetal heart makes it distinguishable even in the midst of louder isolated noises which arise in the abdomen of the mother.

The author's modification of the previous methods of utilizing the phonocardiograph reduces the clinical application of the equipment for the examination of the pregnant woman to a simple and easily performed procedure which is quickly learned by a nurse attendant as it requires no greater skill or dexterity than that necessary for taking electrocardiographic tracings. The attachments are readily added to any electrocardiograph and the patient experiences no more inconvenience or discomfort than that felt by the latter examination. Information secured from the fetal phonocardiogram may come to be a necessary part of every prenatal examination and facilities for the making of such examinations should be made accessible to the prenatal clinic.

THE NORMAL FETAL PHONOCARDIOGRAM

Phonocardiographic records of the heart sounds have been made for many years; Frank¹ in 1904 and Weiss and Joachim² in 1908 were the first to attempt recording these sounds. Einthoven,³ Gerhartz,⁴ Bull,⁵ Battaerd,⁶ Marbe,⁷ Ohm,⁸ DeMeyer,⁹ and Lewis¹⁰ are but a few of the outstanding investigators of this method. The mechanical and technical difficulties encountered in the registration of the heart sounds and the complexity of the apparatus and equipment required, did much to prevent the procedure from attaining the clinical use which the examination merited. With the discoveries and advances made in the field of radioelectrical engineering, many of the previously insurmountable difficulties were disposed of and the last few years have witnessed epoch-making strides in the perfection of the phonocardiographic method.

Scheminzy,¹¹ Lutenbacher,¹² Benatt,¹³ Trendelenburg,¹⁴ and Groedel¹⁵ have within recent times developed phonocardiography to a relatively high degree of accuracy and special studies devoted to heart sounds and murmurs have done much to clarify this interesting but frequently not well understood branch of medicine. A revision of previously existing theories of heart sounds and murmurs is now tak-

ing place and many of the older widely accepted beliefs in cardiovascular disease are in the process of being changed.

Typical phonocardiographic records are shown in Fig. 4. Simultaneous electrocardiographic tracings have been taken to show the relation between the heart sounds and the electrodynamic phenomena of this organ. It will be noted immediately that although the second sound of the heart is usually described clinically as being predominant in that it is apparently the louder and longer of the two heart sounds, it is the first sound, in fact, which causes the greatest graphic oscillation. This is found to be true also in mitral stenosis where clinically the first sound of the heart is accentuated; this is seen in Fig. 10B.

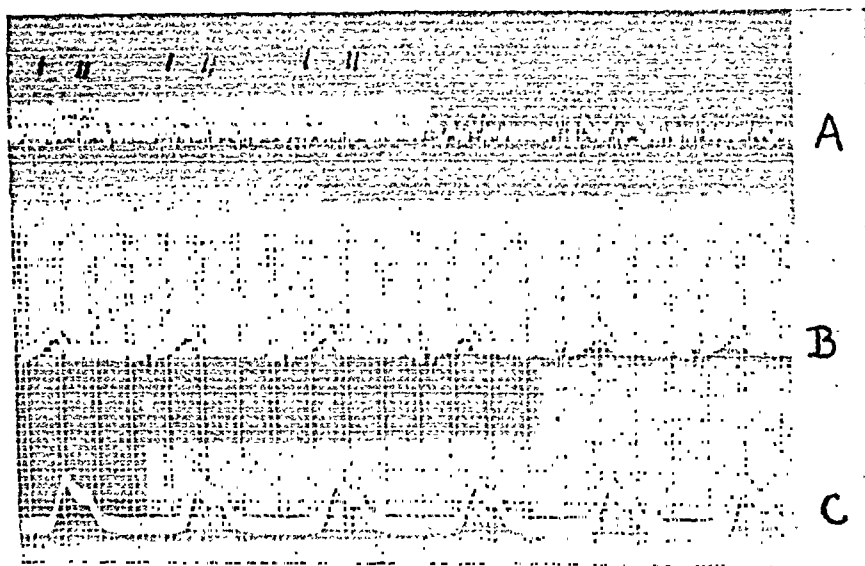


Fig. 4.—Graphic registration of the heartbeat; simultaneous study of the heart sounds, the electrodynamic activity, and the actual mechanical contraction of the heart. A, Phonocardiogram of normal heart sounds. Note that the first heart sound displays a greater oscillation than the second. B, The electrocardiogram. C, Polygraphic tracing of the radial pulse.

Phonocardiographic investigations of the fetal heart sounds were first attempted in 1926 by Sampson and McCalla;¹⁶ they were able to demonstrate not only the fetal heart sounds but also the occurrence of heart murmurs occurring in utero. Certain cases of congenital heart disease were discovered and diagnosed by them prior to birth of the infant. In Fig. 5 are phonocardiographic tracings in such a case together with records made after birth of the child; I am especially indebted to these able investigators for their courtesy in permitting me to reproduce this record which is one of their original epoch-making contributions to the science of modern medicine. Using by-pass filters of different frequencies they were able to study the oscillations made by the fetal band under investigation; their records shown in Fig. 5 reproduce these frequencies from 0 to amplitudes of 1100.

Using the string galvanometer in the method previously described, I have been able to obtain graphic records of the fetal heart which compare very favorably with those secured by Sampson's more complicated apparatus. In Fig. 6 is a typical fetal phonocardiogram made during the eighth month of pregnancy; the first and second heart sounds are easily identified.

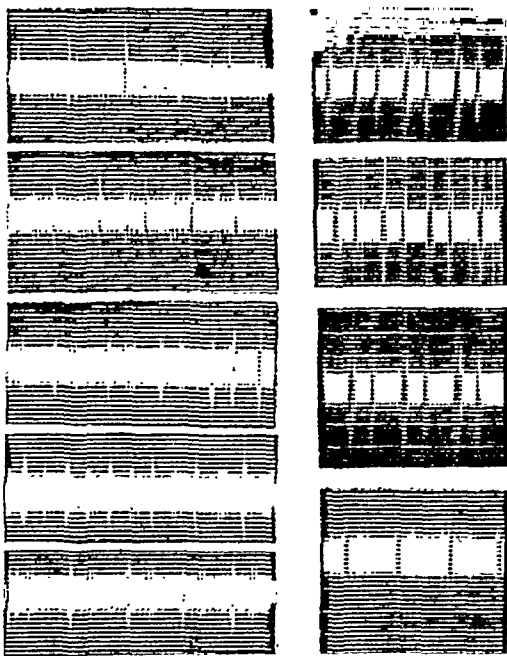


Fig. 5.—Fetal phonocardiogram taken by the Sampson method showing a well-marked sinus arrhythmia as well as a late systolic murmur.

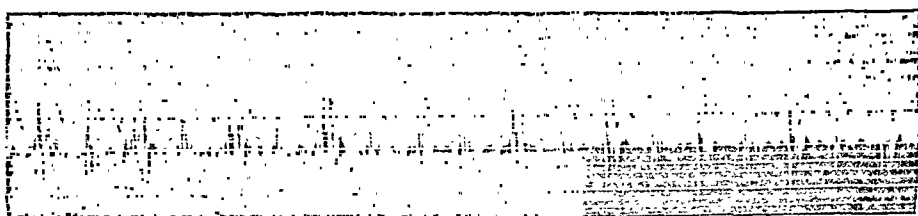


Fig. 6.—Case 7A. Mother, aged thirty-one, para ii. Phonocardiographic tracings of the fetal heart made during the eighth month of pregnancy. The fetal rate is very regular and is about 148 beats per minute. Note the periodic differences in amplitude of the sound vibration.

The addition of the polygraphic tracing of the mother's brachial artery to the fetal phonocardiogram presents a method of studying the maternal and fetal circulations at the same time. Fig. 7 is a typical normal record showing the relationships of the two circulations; in this case, for example, the maternal pulse rate is 68 beats per minute while the fetal rate is 134. The opportunity for clinical research opened up by this method can only be suggested here; the influence of drugs, toxic conditions, fetal and maternal diseases, and many other

conditions can be studied in their effect upon one or the other cardiovascular system. Many obscure pathologic conditions which affect either the mother or the fetus may be investigated in regard to their mutual effect upon each other and much new information may be secured. In this connection it may be mentioned at this time that a study of the preeclamptic toxemias by this method is now under way and considerable interesting data in regard to this latter condition have already been secured.

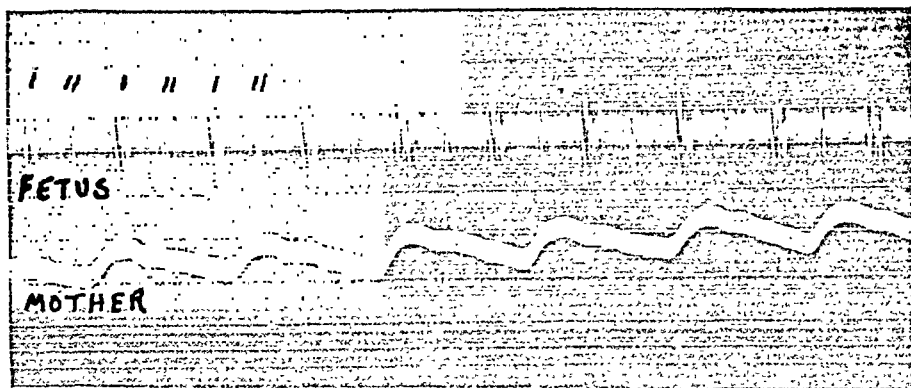


Fig. 7.—Case 21A. Mother, aged twenty-two, para iii. Simultaneous phonocardiographic tracings of the fetal heart taken during the eighth month of pregnancy and the polygraphic tracing of the mother's radial artery. Note that the fetal heart rate is regular at 134 beats per minute and the mother's pulse rate is 68 beats per minute.

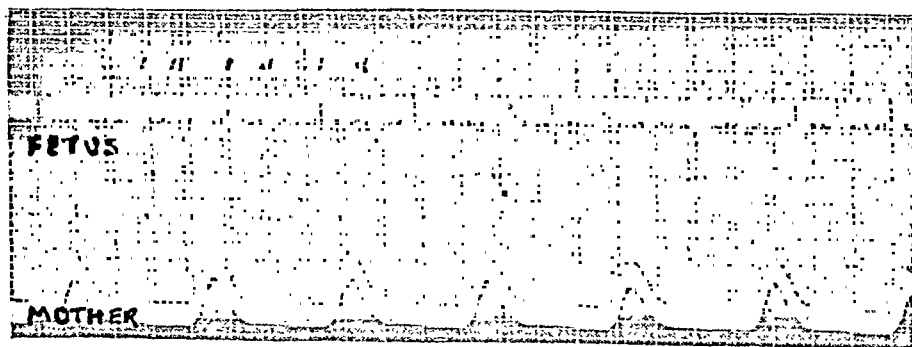


Fig. 8.—Case 41A. Normal fetal phonocardiogram. Fetal heart rate 140 beats per minute. Mother's pulse rate about 84. Tracings taken during the eighth month of pregnancy.

Of especial interest to the obstetrician is the phonocardiographic examination of the fetal heart in very obese patients; ordinarily the fetal heart is never heard during the entire period of pregnancy in such women. This is not an unfamiliar finding in every prenatal clinic; the diagnosis of gestation itself and subsequently of fetal position must be made without the fetal heart ever being heard at all. Fig. 8 represents tracings taken during the eighth month of pregnancy in a very obese patient; this woman weighed 188 pounds and had a tremendously thick abdominal wall through which nothing could be

felt, much less, heard. The tracings taken in a routine method show a regular fetal heartbeat at 150 beats per minute; the mother's pulse rate was 84 beats.

IRREGULARITIES OF THE FETAL RHYTHM

Because of the previous difficulties encountered in examining the fetal heart, no especial attention has apparently been paid to its arrhythmias; the available literature records but few instances where mention has been made of such irregularities. Drosin¹⁷ in 1922 and again in 1925 suggested that the prenatal examination should include a more careful account of the fetal heart beyond that usually made in regard to its rate and position; he was one of the first to suggest that irregularities of the fetal heart could frequently be detected and the diagnosis of possible complications during the later weeks of pregnancy or in labor might be made.

Actual demonstration of fetal cardiac irregularities has, however, apparently been rather infrequent; Schroeder¹⁸ has recently collected

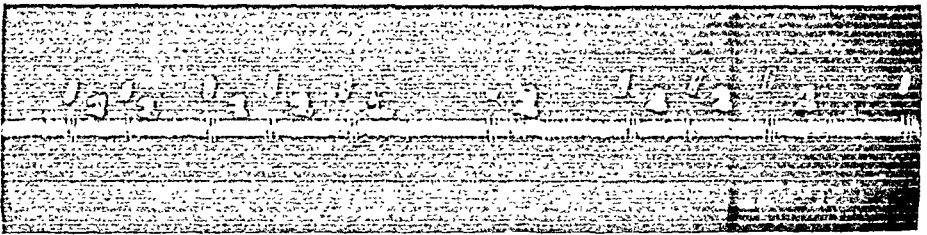


Fig. 9.—Case 12D. Mother aged twenty-six, primipara. Phonocardiogram of fetal heart made during the eighth month of pregnancy. Note the well-marked sinus arrhythmia.

all such cases recorded in the literature. He was able to find but 8 cases not including his own and he concluded that the occurrence of such irregularities must be more common than the situation suggested by the paucity of reported cases would warrant. The finding of only nine instances of fetal arrhythmia in the entire literature on the subject seems to be somewhat inexplicable in view of 21 such cases discovered by us in the past year and a half during which phonocardiographic studies have been made upon pregnant women both in the prenatal clinics and in private practice.

From a study of these 21 cases, irregularities of the fetal heart can be divided into three groups, each of which may be distinguished without difficulty. The first group includes the arrhythmias due to resonance factors within the abdomen; these resonant factors are caused by more or less rhythmic changes in the uterus itself and are most common toward the latter part of pregnancy. They apparently are concerned with uterine contraction which alters the audibility and intensity of the fetal heart sounds. To the unaided ear these changes suggest alterations in the fetal rhythm but graphic investigation has

shown that the differences are due to intensity of sound rather than change of rate. To this group are also added the cases of sinus arrhythmia which occur in utero and which may be so irregular that they might well be mistaken for a true irregularity. Sinus arrhythmia of this type is not infrequently found in infants and young children and it is to be regarded as normal; it suggests an unstable pacemaker mechanism which sooner or later becomes better regulated. It has no clinical significance; Fig. 9 shows such a case of sinus arrhythmia in utero. This record was taken during the eighth month of pregnancy; the mother was a primipara, aged twenty-six. In this connection it is interesting to point out that Sampson (see Fig. 5) previously recorded such types of sinus arrhythmia.

The second group of fetal arrhythmias consists in an interruption of the normal rhythm; this interruption when heard with an ordinary stethoscope suggests a skipped beat. When present it is distinct and recognized without difficulty; it may occur several times a minute but more often it is found only by accident. In the 21 cases of fetal arrhythmia from which this study is made there were six such cases. In Fig. 10 is presented the first case studied by phonocardiographic records and is to my knowledge the first phonocardiographic record ever made of such an irregularity. The case is briefly presented below.

CASE 4A.—Woman, aged twenty-one, primipara, pregnant seven months. The patient had been suffering from mitral stenosis for eight years; she had been decompensated once about four years ago. She was married against her physician's advice and promptly became pregnant. She was a small undeveloped girl weighing about 92 pounds; she presented no especial signs of cardiac decompensation but during the end of the sixth month her physician detected a definite irregularity of the fetal heart which was exceptionally easy to hear because of the thinness of the mother's abdominal wall. In fact the fetal heart was almost as easily heard as the mother's. Alarmed by the irregularity which he heard in the fetal rhythm, the doctor kindly referred the case to me for more complete study. The patient herself showed the usual signs of an old mitral stenosis with a typical mitralized cardiac shadow by orthodiagraphic x-ray examination. The fetal heart could be heard by all of the usual methods and a definite skip could be detected three or four times a minute. A complete graphic survey of both the mother and fetus was made and is presented in Fig. 10.

The phonocardiogram of the fetal heart shows a definite intermission in the cardiac rhythm; it is due to the loss of the second sound and without going into too great cardiology discussion, is probably due to an extrasystole. The phonocardiogram of the mother's heart sounds is also given for comparison as well as the maternal electrocardiogram and polygraphic tracings of the radial artery; it can be noted in passing that the mother shows a right axis deviation of the heart and alterations of the P-waves seen in advanced mitral stenosis. In this figure is thus presented a complete demonstration of both the fetal and maternal circulations and it is shown here to illustrate the type of record which can be made by this method.

The mother went to full term and was delivered with some difficulty; examination of the baby the day after birth showed the irregularity still present. It was

determined at that time to be an extrasystole arising from the right ventricle; it disappeared entirely at the end of the week.

The identification of this type of fetal arrhythmia was made possible by electrocardiographic examination of the baby after birth; the

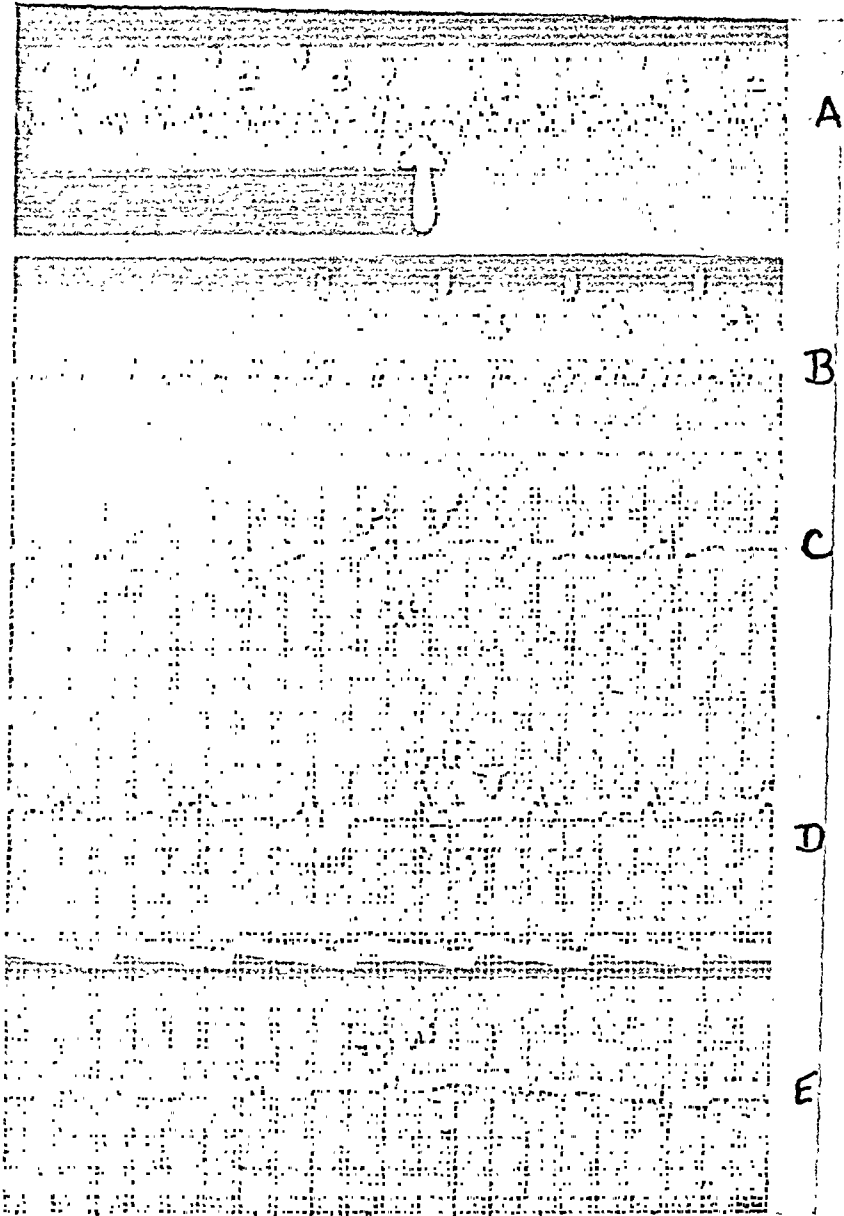


Fig. 10.—Case 4A. Graphic demonstration of fetal and maternal circulations. *A*, Phonocardiogram of fetal heart sounds; the arrow points to the skip in the rhythm heard clinically. *B*, Phonocardiogram of the mother's heart sounds. *C*, Electrocardiogram (maternal) Lead I. *D*, Lead II and polygraphic tracing of the radial artery. *E*, Lead III. The mother's electrocardiogram shows that she has a well-marked mitral stenosis.

skipping of the heartbeat heard both before and after delivery was found to be due to a noneffective right ventricular extrasystole. This finding is interesting in view of the statements made by Schroeder in

his case in which a description of an extrasystolic arrhythmia is given but he definitely states that the irregularity was not due to an ectopic beat. In his case the arrhythmia disappeared a few days after birth; this also occurred in similar cases reported by Seitz,¹⁸ Cohn,¹⁸ and Reihl.¹⁸

The other five cases found in our series presented the same type of cardiovascular disturbance in that the irregularity was due to an extrasystolic arrhythmia of right ventricular origin. In all of the cases the irregularity disappeared in a few days after birth, the longest lasting for about eight days. Of unusual interest was a case in which both mother and fetus had an extrasystolic arrhythmia; this patient, seen through the courtesy of Dr. L. Drosin, was the subject of considerable experimental study, a brief résumé of which is presented below.

CASE 29374.—A para ii, aged twenty-four, small undeveloped woman weighing 118 pounds, was seen during the eighth month of pregnancy because of a distinct irregularity heard in the fetal heart. Examination of the mother showed that

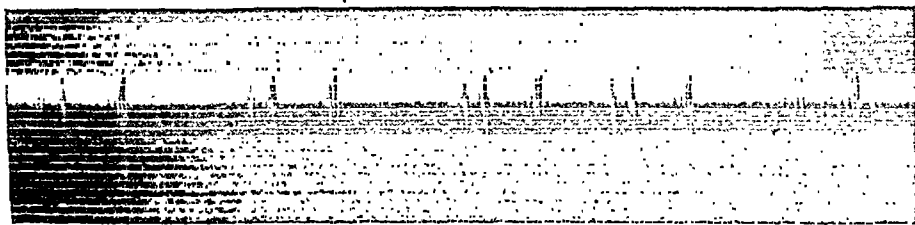


Fig. 11.—Case 29A. Mother aged twenty-six, para ii. Phonocardiographic records taken of the fetal heart during the seventh month. Note the gross irregularity of the fetal heart rhythm; it varies from 92 to 160 beats per minute. Sometimes the second sound of the heart is lost entirely. The mother's physical examination was entirely negative. Her previous pregnancy was uneventful. This patient miscarried about twelve days after these records were taken. The fetal heart sounds in this case could not be heard by the ordinary methods of auscultation due perhaps to the mother's obese abdominal wall and the weak quality of the fetal heart. The heart sounds in this case were amplified three times as much as that seen in Case 21A.

she was also suffering from an extrasystolic arrhythmia, a not especially uncommon finding during pregnancy. A phonocardiogram of the fetal heart showed the same type of irregularity as that seen in Fig. 10. There was no relation, however, between the irregularity in the fetal heart and that of the mother's as they occurred independent of each other. Two days after birth of the child, its irregularity disappeared but the mother's extrasystole still persists.

This type of irregularity apparently has no especial clinical significance as it usually disappears within a few days after birth of the infant. Schroeder thought it was due to certain neurogenic and myogenic factors developing in the fetal heart as the result of obscure metabolic phenomena; Holtermann,¹⁸ on the other hand, believed that toxic disturbances of the maternal circulation were responsible for the condition. Our own belief is that the disturbance is the result of an irritable myocardium and an unstable pacemaker system; its clinical significance is apparently not very great, as all of the cases reported

have cleared up within a few days after delivery. Its discovery by the obstetrician should cause him no undue concern and the diagnosis of the condition is only of interest in differentiating it from the more serious types of fetal arrhythmia to be described later.

The third group of irregularities of the fetal heart are not only more common but also of more sinister significance than the previous two groups. Of the total 21 cases, 11 were found to come within this classification. The irregularity varied from a slight constant change in rhythm to a grossly perverted arrhythmia; from a clinical point of view these latter cases suggest the gross irregularity seen in the rapid auricular fibrillation of decompensated cardiac patients. While such types of auricular fibrillation are seen most commonly in late adolescent life from eighteen to thirty years of age, occasionally it is found in very young children¹⁹ and even infants.²⁰ Auricular fibrillation occurring in utero has, however, never been described but examination of fetal phonocardiograms taken in this third group of cases suggests that this condition may actually be present in uterine life and may be responsible for certain hitherto unexplained abortions.

Three such cases from our series of 11 are herewith presented in some detail to illustrate the type of fetal irregularity found; these three cases are, more or less, representative of the whole group and it is to the study of these that future investigations must be devoted.

CASE 29A.—Para ii, aged twenty-six, seen during the seventh month of pregnancy. The mother's physical examination was entirely negative. Her previous pregnancy and delivery were uneventful. The fetal heart sounds could not be heard by the ordinary methods of auscultation as the patient was a very heavy woman with a large abdominal wall. The phonocardiographic examination was made to establish the presence of the fetal heart. The records obtained (see Fig. 11) showed a gross irregularity in the fetal heart rhythm which varied from 92 to 160 beats per minute; more important, however, than the mere variation in rate was the frequent loss of the second heart sound. These records were repeated on the following day with the same result. A diagnosis of gross irregularity of the fetal heart was made. About twelve days later the patient had a slight uterine hemorrhage which was followed in about an hour by a complete abortion; this occurred during the patient's stay in a near-by city and no examination of the fetus or the heart itself could be made.

CASE 34B.—Primipara, aged twenty-eight, seen during the sixth month of pregnancy. The mother's physical examination was entirely negative except for a large trace of sugar in her urine which appeared for the first time during the fifth month; her blood sugar on two examinations was 155 and 165 mg. Fetal phonocardiograms (see Fig. 12) showed a gross irregularity of rhythm and rate; the latter varied from 148 to 210 beats per minute. This irregularity could be noted also by auscultation as the patient had a thin abdominal wall. Without special treatment, save a moderate reduction of carbohydrate intake, the patient's urine became sugar-free about four days after these records were taken. About ten days later the patient suddenly miscarried and the fetus was very fortunately obtained for postmortem examination. The fetal heart was carefully sectioned but no especial pathologic changes could be detected.

CASE 44B.—Para ii, aged twenty-seven, normal physical examination. Fetal phonocardiograms (see Fig. 13) taken during the ninth month of pregnancy showed a gross irregularity in the fetal rhythm which could also be heard clinically. The rate varied from 120 to 200 beats per minute with frequent pauses of complete asystole of the heart for about a half a second. The mother was delivered without difficulty but the baby failed to breathe, resuscitation of all types including intracardiac injection of adrenalin finally resulted in automatic respiration. The infant's heart examined from time to time during the next few days showed a grossly irregular pulse; no electrocardiographic studies could be made because of inaccessability of the apparatus, the institution not being provided with this equipment. When examined, however, at the end of the third week the heart was apparently normal and the electrocardiographic tracings revealed nothing unusual.

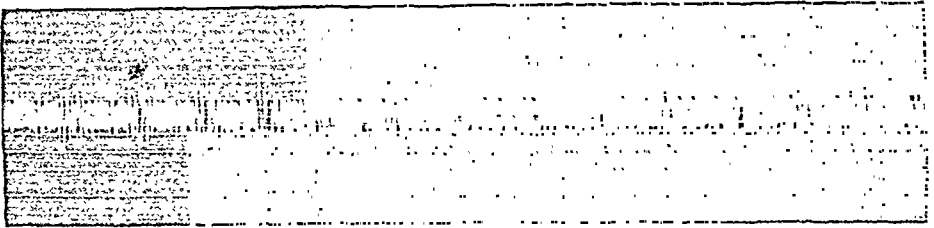


Fig. 12.—Case 34B. Mother aged twenty-eight, primipara. Phonocardiogram of fetal heart made at middle of sixth month of pregnancy. Note that the fetal heart rhythm is grossly irregular and varies from 148 to 210 beats per minute. The rhythm suggests that seen in auricular fibrillation or flutter of the adult heart and can be easily differentiated from the fetal sinus arrhythmia seen in Case 12D. The mother suddenly miscarried about two weeks after this record was taken. The obstetrician reported that no cause for the miscarriage could be found.

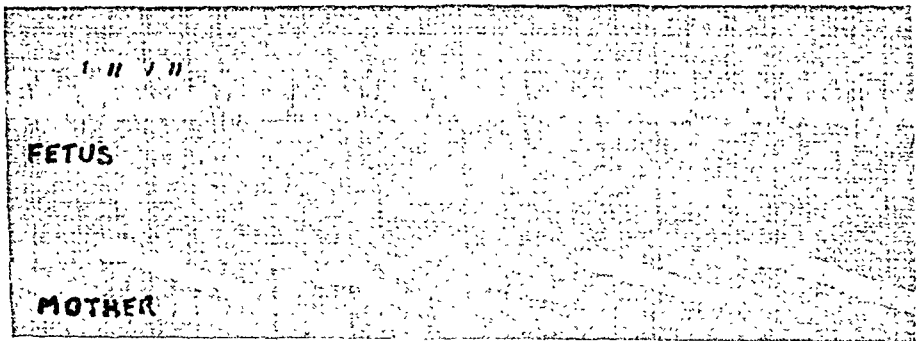


Fig. 13.—Case 44B. Gross irregularity of the fetal heart. Phonocardiogram showing fetal heart varying in rate from 200 to 120 beats per minute. At times the fetal heart shows complete asystole for about one-half second. The mother's pulse is regular at a rate of 72 beats per minute. This record was taken during the ninth month. The mother, a para ii, delivered without difficulty but the baby was resuscitated after thirty minutes.

It is of importance to note that the discovery of gross fetal cardiac irregularities was associated in these cases with either sudden interruption of pregnancy or in difficult resuscitation of the infant after delivery. No discussion of the mechanism responsible for spontaneous abortion in the first two cases so far as it relates to the disturbance of cardiac rhythm in the fetus can be entered into here, but sufficient evidence is at hand to suggest a very definite correlation between the two conditions. Only after the study of many such cases from every angle, both clinical and postmortem, can any true deductions be made

in regard to the relationship between cardiovascular disturbances in utero and the establishment of spontaneous abortion. The purpose of this paper is merely to indicate that gross irregularities of the fetal heart may be responsible for such unexplained miscarriages; from a purely cardiologic point of view, if this irregularity is a true intra-uterine auricular fibrillation the *modus operandi* may not be difficult to explain as somewhat similar disturbances are seen in adult cases suffering from this disease.

SUMMARY

Study of the fetal heart sounds by means of the phonocardiogram has demonstrated that the occurrence of cardiac irregularities in uterine life is not an infrequent discovery. These irregularities can be divided into three general groups, the first two of which constitute about 80 per cent of all the irregularities. The first group consists of an exaggerated physiologic disturbance of the pacemaker mechanism in which a marked sinus arrhythmia develops; this condition persists throughout childhood and finally disappears at the latter end of adolescence. It has no especial clinical significance but it should be recognized in order to make an accurate differential diagnosis from the third and more serious group of irregularities.

The second group of fetal arrhythmias consists of a skipping or alteration in the regular rhythm of the heart; this intermission is probably due to an intrauterine extrasystolic arrhythmia. It has been previously described by several authors under different names, but the general impression seems to be that the condition is relatively unimportant inasmuch as it disappears within a few days after delivery. Our own cases substantiate this opinion and we believe that its occurrence is evidence of a hyperirritable myocardium which may be the result of improper hygiene, poor posture, or an unsuitable dietary on the part of the mother. This type of irregularity is not difficult to discover if present, and it must, like the first group of irregularities, be differentiated from the third type.

The importance of the fetal irregularities lies primarily in the further investigation of the grossly perverted types of fetal heart rhythms seen in the third group. The combined attention of both obstetrician and cardiologist must be focused upon the mechanism responsible for this change in the cardiovascular system of the fetus. If this condition is due to auricular fibrillation as is suggested by graphic studies of this disease when compared to adult types of auricular fibrillation, indications as to therapy may be made and a new avenue of approach to the possible prevention of certain types of abortion may be accomplished.

Widespread clinical application of the phonocardiographic method of examining the fetal heart will undoubtedly add considerable infor-

mation of extreme importance to the obstetrician; the opportunity presented for a simultaneous study of the fetal and maternal circulations opens up many lines of research in regard to the problems attending gestation. Some of these have previously been hinted at; a study of the various toxemias and other insufficiently understood metabolic disturbances accompanying the pregnant state can be investigated by this method. The prevention of abortion when due to heart disease of the fetus may not be unexpected when a fuller comprehension of the basic causes responsible for the condition is more readily understood by the facts brought to light by the clinical utilization of this new method of examination.

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1235 PARK AVENUE.

Neuman, H. O., and Oing, M.: Accessory Breasts and Accessory Nipples. Arch. f. Gynäk. 138: 494, 1929.

The frequency with which accessory breasts and nipples were found in the Marburg clinic led the authors to compile statistics. The incidence in 1000 consecutive cases was 5.3 per cent; in the 500 puerperal women being 6.8 per cent, and 3.8 per cent in the 500 gynecologic patients. In 23 cases there was a marked increase in the size of these accessory breasts during pregnancy and the puerperium with active secretion. These secretions when examined microscopically, proved to be colostrum during pregnancy and milk during the puerperium. Three patients had marked swelling without active secretion. Of the gynecologic patients, 37 gave a history of swelling and secretion during previous pregnancies. Localization of these accessory breasts and nipples followed the embryonal milk line accurately, 30 per cent being above the normal breast and 70 per cent below. Embryologic studies show the milk line to extend from the axillary space down the chest and abdomen and to contain anlagen for milk glands, sebaceous glands, and hair follicles. However, only the milk glands develop as they are specialized glands. Microscopic examination of accessory breasts and nipples often showed a complete absence of excretory ducts. Patients showing a genital hypoplasia exhibited polymastia and polythelia in only 4 per cent. The authors could find no hereditary tendency toward this condition.

RALPH A. REIS.

SPIROCHETES IN PUERPERAL FEVER

BY A. F. LASH, PH.D., M.D., CHICAGO, ILL.

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IN THE course of bacteriologic studies of the normal and pathologic flora of the female generative tract, spirochetes were observed in the vaginal and cervical secretions of nonpregnant, pregnant, and puerperal women. These organisms did not resemble the *Spirocheta pallida*, and no mention was made of them in the standard works of obstetrics, gynecology, or bacteriology. Only a brief reference was made to them in Winkel's *Handbuch der Geburtshilfe* and none in the section on vaginal flora in Kolle-Wassermann's *Handbuch der pathogenen Mikroorganismen*. Since they were present with other bacteria in patients with severe and fatal puerperal fever, the subject of nonspecific spirochetes in these infections deserved consideration; especially since there were not publications in the American literature and only the observations of Philipp in the German.

The first definite reference to spirochetes was made by Hausmann in 1870 in his booklet on *Die Parasiten der weiblichen Geschlechtsorgane*. He described as "vibrionen," small threads which elongated in a snake-like manner while moving in a brisk boring manner. His illustration resembled that of a *Spirocheta refringens*. The secretions were obtained from girls with catarrh of the genitals, from non-pregnant and pregnant women with sour and profuse secretions.

Werner found spirochetes with gonococci in a case of chronic endocervicitis. He described the spirochetes as being plumper than the *pallida* variety but more slender than the mouth and teeth spirochetes.

Later his patient developed a colpitis emphysematosa; culture of the contents of the small cysts yielded a B. colon group organism. This article was the first publication on spirochetes in gynecologic literature.

There have been repeated reports in dermatologic works of finding spirochetes in the vagina, especially at the introitus in the presence of inflammatory processes, such as condylomata acuminata.

Noguchi and Kolisko described three forms in the spirochetal flora of the normal female genitalia. They studied the morphologic and bacteriologic characteristics of these forms which were named, *Treponema minutum*, *Treponema colligryum*, and *Spirocheta refringens*.

In 1924 Philipp published the results of his study of 300 normal puerperae. He found spirochetes in 5 per cent of the vaginal smears. The three types as described by Noguchi were present. The *refringens* form, as found in the mouth, was large, thick and plump. The *denticola* type was smaller, slender with small spirals. A very small spirochete with small and hardly recognizable spirals was also present. This latter form resembled the *Spirocheta icterohemorrhagica* which causes Weil's disease. One single type was found or two types or all three were present. The reaction of the secretion was acid or neutral.

In these women, no pathology of a profuse discharge was present which usually occurred in the puerperium. The spirochetes were found in the vaginal vault, cervical mucus and uterine cavity. When they were found in the uterine cavity in puerperal fever, he did not consider them an etiologic factor but rather symbiotic organisms. It was chiefly in gangrenous processes that the spirochetes were seen. The spirochetes occurred in the vaginal secretions before delivery, they disappeared during delivery and then suddenly appeared in an explosive manner so that myriads were seen.

Philipp observed three cases with acute infections and described a definite clinical picture. The labia minora were more or less edematous. The vaginal mucous membrane near the portio was superficially eroded and covered with a thin necrotic layer. The vaginal discharge was serous and not foul smelling, having the appearance of egg white thinned out. The temperature was 38.5° C. The general condition was good but the patient complained of the discharge which was very annoying and produced a pruritus.

After four or five days, the acute inflammation of the genitals subsided. The superficial necrotic epithelium was cast off and the underlying cells regenerated. The edema subsided and the discharge disappeared. The temperature dropped to normal and the spirochetes disappeared. Healing occurred spontaneously, although Philipp observed that bichloride of mercury irrigation of the vagina hastened the disappearance of the spirochetes. He made the diagnosis on the local pathologic picture, dark-field examination of the secretions and stained smears. Pieces of tissue stained by the Levaditi method showed the spirochetes.

Philipp suggested that these spirochetes might be the cause of multiple sclerosis, eye infections and jaundice in puerperal sepsis which might be a Weil's disease arising from genital infection.

There have been no further publications on these nonspecific spirochetes since 1924. However, case reports of Vincent spirochetes and fusiform bacillus infection of the female genitals have been published by McCormac, Spillman and Pilot. Kanter and Pilot found spirochetes associated with the fusiform bacillus in the smegma of 58 per cent of normal pregnant women. They found the associated organisms to be staphylococci, colon bacilli, diphtheroids, and streptococci. They considered the occurrence of the fusiform bacilli and spirochetes with pyogenic bacteria in certain genital lesions as indicative of a primary or secondary rôle played by these organisms in causing ulcerative and gangrenous processes. These investigators were unable to find these organisms in the vagina.

In a series of personal studies of 98 normal pregnant women, spirochetes were observed in vaginal smears in three instances (3 per cent). In the vaginal cultures of these three patients, diphtheroids and streptococci viridans were found in one, yeasts, diphtheroids, and Micrococci tetragenes in the second and Staphylococci albus and aureus in the third. In the first two, fusiform bacilli were also seen in smears.

Smears taken from the cervix of 40 women just before salpingectomy revealed spirochetes in two cases or 5 per cent, which about equalled the incidence in normal pregnant women and in the puerperae studied by Philipp.

Of 118 patients with puerperal fever, spirochetes were observed in the cervical secretions of 8 (6.8 per cent). The clinical, pathologic, and bacteriologic observations form the basis for this paper. The clinical records of these patients are briefly as follows:

CASE 1.—R. K. Black, aged twenty, grav. ii, entered the hospital on May 20, 1925 because of vaginal bleeding, abdominal pain, and fever of two days' duration. She had delivered on May 18, 1925 a full-term baby spontaneously after a twelve-hour labor. The essential findings were temperature 102.6°, pulse 120, and respirations 28. Tenderness was present over the corpus uteri which was three fingers below the umbilicus. Cervical smear showed the three forms of spirochetes and gram-positive diplococci. The cultures yielded diphtheroids and *Staphylococcus albus*. Wassermann test was negative.

The septic course continued, the temperature varying between 101° and 104° F. On June 6, 1925, 0.6 gm. neoarsphenamine in aqueous solution was given intravenously. On June 8, 1925, the patient felt somewhat better and her temperature was 100.4° F. After this there was a rise to 100.6° F. once, and the temperature remained around 99.4°. On June 10, 1925, a piece of foul-smelling necrotic placental tissue was removed from the cervix. Convalescence was uneventful and the patient went home on July 6, 1925.

CASE 2.—R. R. Black, aged twenty-six, grav. v. Entered the hospital December 14, 1926 with the clinical picture of puerperal fever as in Case 1. Lochia was foul, sanguineopurulent; cervical smears showed many spirochetes with gram-positive diplococci. Wassermann was two-plus. Septic course subsided after eight days.

CASE 3.—E. S. Black, aged twenty-eight, para. iv. Entered the hospital on May 27, 1925, because of lower abdominal pain and vaginal discharge of two weeks' duration. On May 13, 1925, she delivered a seven-months' baby spontaneously; anorexia was present for one week, and dizziness. The essential findings were temperature 103° F., pulse 102, respirations 24, marked tenderness in both iliac fossae. Rectal examination found the corpus somewhat enlarged, retroflexed, firm, tender and fixed with tender, fixed adnexa. The vagina appeared red and from it came a foul greenish yellow mucopurulent discharge. Smears revealed the three types of spirochetes, gram-negative, extracellular diplococci, gram-positive diplococci, gram-negative bacilli and diphtheroids. On June 1, 1925, 0.6 gm. neoarsphenamine in aqueous solution was given intravenously. An acute pharyngitis developed on June 4, 1925 and throat smears showed the Vincent spirilla and fusiform bacilli. Another dose of 0.6 gm. of neoarsphenamine was given. The following day the fever subsided and the patient made an uneventful recovery. The spirochetes disappeared from the throat and vagina.

CASE 4.—I. D. White, aged thirty-eight, para v. Entered the hospital January 14, 1927, and delivered a five-months' fetus which was followed by foul brownish amniotic fluid. Manual removal of the placenta was necessary. The temperature was 100.4° F., pulse 120, respiration 28. The uterus was prolapsed, and about half the length of the cervix protruded from the vagina. Cervical smears showed spirochetes and gram-positive diplococci; cultures grew only a nonhemolytic streptococcus. Wassermann test was negative. A moderately severe septic course followed. On January 20, 1927 patient experienced a sudden pain in the chest and coughed up a bloody sputum. Chest findings of an infarct were found. Roentgen examination of the chest on January 31, 1927, showed a cavity, 12 x 14 mm., dorsal to the middle of the right third intercostal space which was considered a probable abscess. There was consolidation dorsal to the left second intercostal space which was considered to be a preabscess consolidation. The febrile course ranged from 101.2° F. to 103.6° F. which persisted until February 8, 1927 when temperature became normal. She left the hospital on February 14, 1927.

CASE 5.—O. D. Black, aged seventeen, para ii. Entered the hospital March 8, 1927, six days after a spontaneous abortion of about a four months' pregnancy. Her chief complaints were pain in the lower abdomen and vaginal bleeding. Es-

sential findings were temperature 102.4°, pulse 124, respirations 26. The leucocyte count was 27,300. The abdomen was moderately distended, tympanitic with definite tenderness in both iliac fossae. Vaginal examination revealed the corpus the size of a two months' pregnancy, firm, fixed, and tender. The left adnexa were represented by a tennis ball sized mass which was fixed and tender. The lochia were still bloody. Cervical smear showed many of the fine variety (*Treponema minutum*) of spirochetes with gram-negative bacilli and gram-positive diplococci. Although streptococci were seen in the broth culture they were overgrown by a colon group bacillus on blood agar plates. The subsequent clinical course was septic in character for fifteen days, when the temperature dropped to normal and remained there.

CASE 6.—F. O. Black, aged twenty-five, para ii. Entered the hospital July 1, 1927, because of lower abdominal pain and vaginal bleeding of nine days' duration. She had been aborted by a midwife on June 19, 1927. The essential findings were those of an acute metritis, parametritis and pelvic peritonitis. The febrile reaction varied from 99.6 to 106.4° F. Cervical smears showed the three forms of spirochetes, and gram-positive cocci. Cultures yielded nonhemolytic streptococci and hemolytic *Staphylococcus albus*. The septic course persisted for twenty days and then subsided allowing the patient to go home on the thirtieth of July.

CASE 7.—T. R. Black, aged thirty-two, para ii. Entered the hospital on May 18, 1925 at the end of the first stage of labor and in forty minutes delivered a dead full-term baby. She had not felt life for eight days and had chills and some fever for two days associated with nausea and vomiting. The placenta was thickened and softened. After delivery the mother appeared to be toxic and in poor condition. Two large grapefruit size fibroids extended from the fundus into the right and left flanks. The lochia on the fourth day postpartum was dark, foul, granular, serosanguineous. A watery diarrhea was also present. Although there were only a few spirochetes on the twenty-second of May, there were many of the different types on the thirtieth of May in the vaginal and cervical smears. The Wassermann reaction was negative. The blood picture was hemoglobin 80 per cent, red cells 3,864,000, white cells 31,950 with 53 per cent polymorphonuclear neutrophils. A marked septic course followed. On May 30, June 1, and 5, 0.6 gm. neoarsphenamine in aqueous solution was given intravenously. The condition varied but little and on July 1, 1925 although afebrile for three days the patient developed a thrombophlebitis of the right femoral vein. The following day she resumed her septic course and died on July 9, 1925 after being in the hospital fifty-one days. The essential autopsy findings were: subacute diphtheritic and gangrenous endometritis, huge intramural fibromyoma with red degeneration; thrombophlebitis of parauterine veins with extension into the iliac veins, inferior vena cava and retrograde extension into the right femoral vein; abscess of the culdesac with spontaneous perforation into the rectum; fibrinous and extensive fibrous pelvic peritonitis, multiple metastatic abscessed and hemorrhagic infarcts of the lungs.

CASE 8.—J. M. Black, aged thirty-eight, para iv. She entered the hospital on January 28, 1929, and aborted spontaneously a five months' dead fetus. The placenta required removal with a forceps. She was septic on admission, but on the second day postpartum she developed a foul bloody lochia. Dyspnea developed on the fourth day postpartum unassociated with any chest pain. The septic course continued, the temperature reaching 105.8° F., and pulse 160. The patient died on the eighth day postpartum. Cervical smears and culture showed spirochetes, fusiform bacilli and nonhemolytic streptococci. At necropsy the essential findings were diffuse ulcerative vaginitis; acute ulcerative gangrenous purulent endometritis and metritis, left focal purulent parametritis, multiple septic infarcts of both lungs, multiple acute abscesses of both lungs. Bacteriologic study of the uterus yielded *Staphylo-*

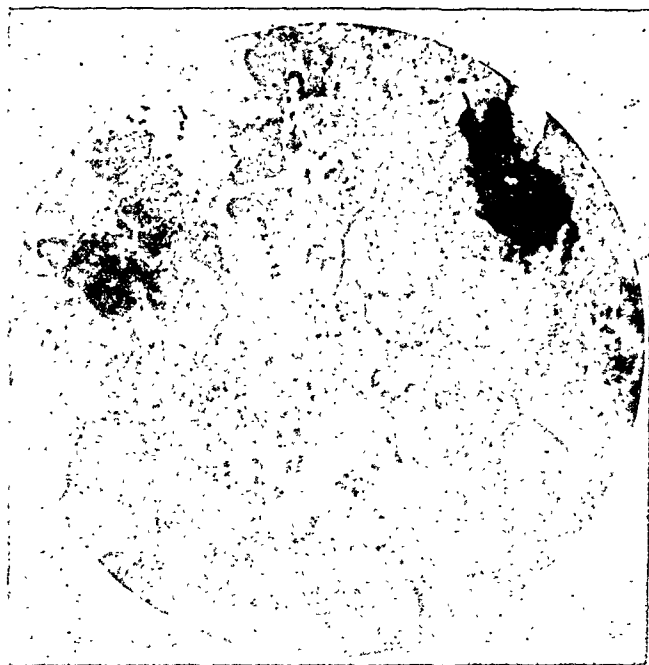


Fig. 1.—Cervical smear (gram stain) illustrating the various types of spirochetes.
x1200.

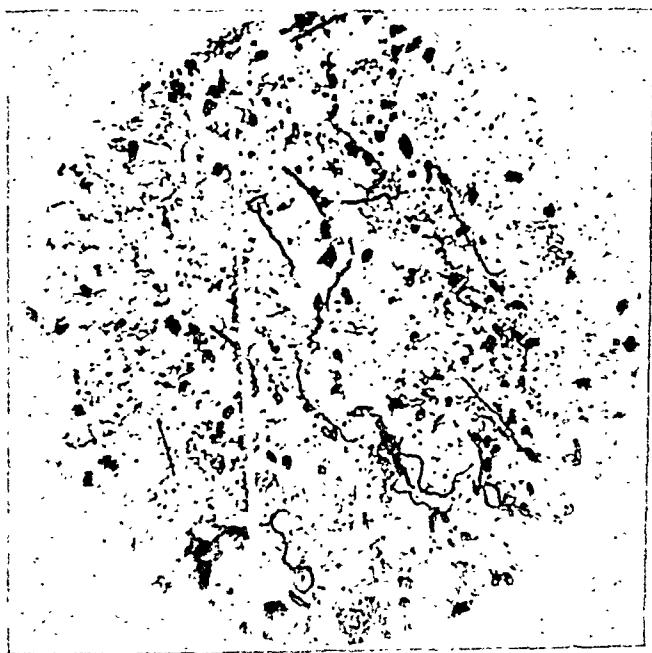


Fig. 2.—Cervical smear (Fontana stain) illustrating the various types of spirochetes.
x1500.

coccus albus, nonhemolytic streptococcus; of the left parametrial abscess, pneumococci, staphylococci and bacilli of the colon group; of the septic pulmonary infarcts, pneumococci, staphylococci and bacilli of the colon group.

An attempt to cultivate the spirochetes in anaerobic brain media was unsuccessful. Smears stained by the gram method or with 10 per cent carbolfuchsin or the

Fontana method showed the various forms of spirochetes described by Noguchi. Under the dark-field microscope the spirochetes were very well seen, occurring in the various sizes and progressing by a rapid corkscrew motion.

Cervical secretions containing many spirochetes and pyogenic organisms were injected subcutaneously into a guinea pig. By the fourth day a nodule appeared in this area. By the eighth day, this nodule was soft and fluctuant. On aspirating the abscess, the pus was greenish yellow but not foul. Within a few days after the aspiration, the mass disappeared. Dark-field examination showed myriads of spirochetes and other organisms. In one field I observed a coarse spirochete lengthen while in motion and finally divide into two spirochetes. The largest and coarse spirochetes, that is, the refringens type described above, had deep curves which were six to ten in number. The medium sized and fine types had more shallow curves which were three to six in number.

An analysis of the above case reports revealed a similarity in the clinical course of this mixed infection of spirochetes and various pyogenic organisms in the puerperal generative tract. The variation in the individual cases was dependent on the degree of involvement of the uterus and adjacent structures. In Cases 1, 2, and 3, there was an acute vaginitis, endometritis, and metritis. In Cases 4, 5, and 6, acute metritis and parametritis was present, while in Cases 5, 7, and 8, a thrombophlebitis was also present and septic embolic lesions occurred. It was of interest to note the frequency of septic embolic lesions in the lungs in this very short series of cases. However, it was not surprising when one considered the studies of fusospirochetal pulmonary infections with septic emboli in the brain by Pilot and Davis.

Although the clinical course was characterized by marked febrile reaction, there was no prostration and the chief determinative finding was a sanguineopurulent lochia which was foul in some instances, and the presence of the spirochetes in the lochia.

The treatment used was based on the spirocheticidal action of ar-sphenamine and on the favorable influence of the drug on the fusospirochete infection of Vincent's angina and gangrenous balanitis. Koehler, in his book on the *Therapy of Puerperal Fever*, mentions ar-sphenamine and neoarsphenamine as therapeutic agents for stimulating antibody reaction through greater activity of the bone marrow rather than as a specific agent. In the use of the drug in addition to appreciating the usual precautions, one must use it before too marked pathologic damage has occurred. Therefore the neoarsphenamine was used for its nonspecific and probable specific effect.

CONCLUSIONS

1. A mixed infection of spirochetes and pyogenic organisms has been observed during the puerperium. These spirochetes are different from the Vincent's or pallida forms.

2. The spirochetal and pyogenic puerperal fever follows a characteristic pathologic and clinical course. The diagnosis is based on the character of the lochia and on the presence of spirochetes.

3. The therapy used in this type of infection may be considered of nonspecific and probable specific nature.

4. The importance of studying smears and the bacteriology of the lochia in puerperal infections is again illustrated. It is only by such means that definite diagnosis, prognosis, and therapy may be established in the study of puerperal fever.

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Moench, G. L., and Schulman, A. A.: Preliminary Report of the Results Obtained with Electrocoagulation in Chronic Inflammation of the Cervix Uteri. Med. J. & Rec. 131: 131, 1930.

The methods of choice in the treatment of chronic inflammation of the cervix are the actual cautery and electrocoagulation, but the latter seems to give better results.

Electrocoagulation has certain advantages over the cautery: It produces less heat in the vagina. It is more easily controlled. There is less risk of injury to the soft parts surrounding the cervix. There is not the odor of burning flesh as in cauterization. The resulting slough separates more easily. There is less tendency to hemorrhage and less tendency to stenosis.

Electrocoagulation appears markedly superior to surgery because no inelastic scar is formed which might cause dystocia in subsequent pregnancies. As in every form of treatment discrimination must be used, neither the electrocoagulation nor any other mode of therapy constitutes a general panacea for all cervical lesions.

WM. C. HENSKE.

Norris, Charles C., and Behney, Charles A.: Ovarian Transplantation. Surg. Gynec. Obst. 49: 642, 1929.

Ovarian transplantation is not a substitute for conservation of the ovary in its normal situation and should be reserved for those cases in which this is inadvisable. The life of the transplanted ovary is probably not more than two or three years. Grafts frequently become tender for a day or two each month. They rarely give serious trouble. The operation is practically without mortality or morbidity. Most of the grafts "take." When the menopause occurs, it is generally more prolonged, gradual, and analogous to the normal menopause than if grafting had not been performed.

WM. C. HENSKE.

ECTOPIC PREGNANCY*

A CLINICAL STUDY OF 474 CASES

BY BENJAMIN E. URDAN, M.D., MILWAUKEE, WIS.

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THE knowledge of the pathogenesis, treatment, etc., of ectopic pregnancy is almost complete today, but the diagnosis is still a difficult problem. This analysis, therefore, was undertaken with the view of noting the most common signs and symptoms and, of stressing those, which though uncommon, aid greatly in making a positive diagnosis.

INCIDENCE

In the period from January 1, 1912, to March 1, 1930, a period of slightly more than nineteen years, there were 474 cases of ectopic pregnancy operated upon at Mount Sinai Hospital. The incidence in gynecologic hospital cases is about 1.5 per cent, which is in agreement with that quoted by other writers.^{2, 3} However, the incidence of extrauterine gestation has best been analyzed by Schuman,⁴ whose studies in the city of Philadelphia reveal one ectopic pregnancy to every 300 intrauterine pregnancies.

AGE

The age of the patients was recorded in 472 cases and ranged from nineteen to forty-five years inclusive. Thirteen patients were forty or more years of age. Three hundred patients, or 63.5 per cent, were in the decade of twenty-four to thirty-three years inclusive. The ages with the number of cases during each year of age are given in Table I.

TABLE I

| AGE | NO. OF CASES | AGE | NO. OF CASES |
|-----|--------------|-----|--------------|
| 19 | 5 | 33 | 20 |
| 20 | 7 | 34 | 22 |
| 21 | 6 | 35 | 29 |
| 22 | 14 | 36 | 13 |
| 23 | 19 | 37 | 17 |
| 24 | 27 | 38 | 19 |
| 25 | 27 | 39 | 8 |
| 26 | 32 | 40 | 5 |
| 27 | 32 | 41 | 0 |
| 28 | 39 | 42 | 2 |
| 29 | 23 | 43 | 1 |
| 30 | 43 | 44 | 4 |
| 31 | 20 | 45 | 1 |
| 32 | 37 | | |

*From the Gynecological Service of the Mount Sinai Hospital, New York City.

SOCIAL STATUS

The social status was noted in 409 cases. There were 7 unmarried, 2 widowed, and 400 married patients. The length of marriage ranged from two months to twenty-six years. In the case of the widowed patients only the length of time that they lived with their husbands is given.

Table II classifies the number of cases with the respective period of marriage.

TABLE II

| LENGTH | | CASES | LENGTH | | CASES |
|--------|--------|-------|--------|-------|-------|
| 0 | months | 7 | 12 | years | 22 |
| 1-6 | " | 22 | 13 | " | 12 |
| 6-12 | " | 16 | 14 | " | 21 |
| 12-18 | " | 6 | 15 | " | 15 |
| 18-24 | " | 1 | 16 | " | 9 |
| 2 | years | 21 | 17 | " | 12 |
| 3 | " | 23 | 18 | " | 6 |
| 4 | " | 36 | 19 | " | 8 |
| 5 | " | 28 | 20 | " | 5 |
| 6 | " | 25 | 21 | " | 1 |
| 7 | " | 18 | 22 | " | 3 |
| 8 | " | 27 | 23 | " | 0 |
| 9 | " | 16 | 24 | " | 0 |
| 10 | " | 33 | 25 | " | 0 |
| 11 | " | 15 | 26 | " | 1 |

PREVIOUS PREGNANCIES

In 424 cases, the history as to the number of previous pregnancies was noted. This includes induced abortion, miscarriage, and full-term delivery. Ninety-one patients, or 21.46 per cent, including 6 of the 7 unmarried patients, had never been pregnant. One patient had had 15 pregnancies. Two hundred and forty-nine or 58.73 per cent of the patients had had 1 to 3 previous pregnancies. Table III gives the relationship of the number of cases with their respective number of pregnancies.

TABLE III

| NO. OF PREGNANCIES | NO. OF CASES | NO. OF PREGNANCIES | NO. OF CASES |
|--------------------|--------------|--------------------|--------------|
| 0 | 91 | 8 | 4 |
| 1 | 84 | 9 | 1 |
| 2 | 85 | 10 | 1 |
| 3 | 60 | 11 | 0 |
| 4 | 39 | 12 | 1 |
| 5 | 23 | 13 | 0 |
| 6 | 18 | 14 | 0 |
| 7 | 6 | 15 | 1 |

STERILITY

It is generally believed that a period of sterility precedes an ectopic pregnancy. This may be due to previous pelvic inflammation whether caused by gonorrheal infection, a postpartum or postabortal infection, or to adhesions as the result of previous pelvic operations.

In 308 cases, the date of the last pregnancy was noted. The period between the last pregnancy and the present ectopic pregnancy ranged from three months to twenty-one years. The average period of sterility in this group of cases was 3.95 years. The history as to the use of contraceptive measures is rarely given, and, consequently, this important factor must be omitted.

TABLE IV. TIME ELAPSING BETWEEN LAST PREGNANCY AND ECTOPIC PREGNANCY

| TIME | | NO. OF CASES | TIME | | NO. OF CASES |
|-------|--------|--------------|------|-------|--------------|
| 3 | months | 3 | 6 | years | 20 |
| 4 | " | 1 | 7 | " | 16 |
| 5 | " | 2 | 8 | " | 9 |
| 6 | " | 3 | 9 | " | 5 |
| 7 | " | 2 | 10 | " | 8 |
| 8 | " | 5 | 11 | " | 7 |
| 9 | " | 5 | 12 | " | 2 |
| 10 | " | 4 | 13 | " | 2 |
| 11 | " | 2 | 14 | " | 3 |
| 12 | " | 29 | 15 | " | 3 |
| 12-18 | " | 11 | 16 | " | 1 |
| 18-24 | " | 12 | 17 | " | 1 |
| 2 | years | 47 | 18 | " | 0 |
| 3 | " | 43 | 19 | " | 0 |
| 4 | " | 42 | 20 | " | 0 |
| 5 | " | 19 | 21 | " | 1 |

PRIMARY STERILITY

Primary sterility occurred in 91 cases of which 6 were unmarried. In the remaining 85 cases the length of marriage ranged from two months to nineteen years. Five patients were married only two months, while the first pregnancy, after nineteen years of sterile life in one patient, proved to be an ectopic pregnancy.

Of the married patients with primary sterility, 44 were married three years or less, while 41, or 10 per cent, of those whose length of marriage was given, were married more than three years. The per-

TABLE V

| LENGTH OF MARRIAGE | | NO. OF CASES | LENGTH OF MARRIAGE | | NO. OF CASES |
|--------------------|--------|--------------|--------------------|-------|--------------|
| 0 | months | 6 | 4 | years | 12 |
| 2 | " | 5 | 5 | " | 5 |
| 3 | " | 4 | 6 | " | 4 |
| 4 | " | 4 | 7 | " | 1 |
| 5 | " | 4 | 8 | " | 0 |
| 6 | " | 1 | 9 | " | 1 |
| 7 | " | 0 | 10 | " | 2 |
| 8 | " | 3 | 11 | " | 0 |
| 9 | " | 5 | 12 | " | 2 |
| 10 | " | 0 | 13 | " | 2 |
| 11 | " | 1 | 14 | " | 0 |
| 12 | " | 0 | 15 | " | 2 |
| 12-18 | " | 8 | 16 | " | 0 |
| 18-24 | " | 1 | 17 | " | 0 |
| 2 | years | 8 | 18 | " | 0 |
| 3 | " | 9 | 19 | " | 1 |

centage of primary sterility was therefore only 10 per cent. The average period of sterility in the entire group was three and five-tenths years while in those married three years or more it was six and three-tenths years.

"ONE CHILD STERILITY"

There were 81 patients who had had one pregnancy prior to the ectopic pregnancy. The shortest period between the two was three months, the longest sixteen years. Thirty-one patients had been pregnant three years or less prior to the present ectopic, while in 50 cases, or 12.22 per cent, the period of sterility was more than three years. The average period of sterility in this group was four and three-tenths years and in those sterile for more than three years it was seven and thirty-five hundredths years. The total percentage in the absolute and one child sterility group was 22.47 per cent. The average period of sterility in all cases was three and ninety-two-hundredths years.

TABLE VI. ONE CHILD STERILITY. ANALYSIS AS TO PERIOD ELAPSING BETWEEN PREGNANCY AND ECTOPIC

| LENGTH OF TIME | NO. OF CASES | LENGTH OF TIME | NO. OF CASES |
|----------------|--------------|----------------|--------------|
| 1- 6 months | 4 | 7 years | 3 |
| 6-12 " | 4 | 8 " | 1 |
| 12-18 " | 11 | 9 " | 2 |
| 18-24 " | 6 | 10 " | 4 |
| 2 years | 6 | 11 " | 2 |
| 3 " | 12 | 12 " | 0 |
| 4 " | 10 | 13 " | 2 |
| 5 " | 6 | 14 " | 2 |
| 6 " | 5 | 16 " | 1 |

ABNORMAL PREGNANCY PRIOR TO ECTOPIC

In 124 cases there was a clear history as to an abnormal pregnancy prior to the ectopic pregnancy. These cases are listed below:

| | |
|-------------------------|----|
| Miscarriage | 36 |
| Induced abortion | 51 |
| Septic induced abortion | 4 |
| Stillbirth | 1 |
| Forceps delivery | 12 |
| Ectopic | 20 |

It is noted that 20 of these patients had had an ectopic gestation immediately preceding the present one. In all, there were 27 patients who had had previous ectopic gestations, and in only 7 a normal pregnancy intervened between the ectopic pregnancies.

PREVIOUS PELVIC OPERATIONS

As mentioned above, previous pelvic operations, because of the various inflammatory and adhesive processes that follow, are mentioned as etiologic factors in ectopic pregnancy. There were a total of 193 operations performed.

TABLE VII. PREVIOUS PELVIC OPERATIONS

| | |
|---|-----|
| Curettage for abortion | 95 |
| Curettage for menorrhagia and metrorrhagia | 5 |
| Curettage for sterility | 2 |
| Curettage for subinvolution | 4 |
| Curettage for unknown cause | 19 |
| Ovarian cystectomy | 8 |
| Ovarian cystectomy and appendectomy | 2 |
| Appendectomy | 12 |
| Appendectomy with pelvic abscess | 1 |
| Cesarean section | 1 |
| Ectopic pregnancy (salpingectomy) | 27 |
| Avulsion of cervical polyp | 1 |
| Dudley tracheloplasty | 1 |
| Right salpingo-oophorectomy for diseased adnexa | 3 |
| Left salpingo-oophorectomy for diseased adnexa | 1 |
| Ventral suspension of uterus | 2 |
| Posterior colpotomy for pelvic abscess | 5 |
| Myomectomy | 1 |
| Amputation of cervix and colpoperineorrhaphy | 1 |
| Unknown on uterus | 1 |
| Unknown pelvic | 1 |
| In addition there were the following: | |
| Forceps deliveries | 12 |
| Miscarriages | 123 |
| Gonorrhea | 2 |
| Leucorrhea (profuse) | 2 |
| Stillbirth | 1 |
| Eclampsia | 1 |
| Pelvic inflammation | 1 |

Thirty-six patients had been curetted prior to admission to the hospital because of the irregular or prolonged bleeding caused by the ectopic pregnancy, while one patient with no bleeding, but with amenorrhea, was curetted for the induction of abortion.

SYMPTOMS

The two major symptoms of ectopic pregnancy are pain and bleeding. Histories were obtained in 452 cases; 406, or 89.82 per cent, complained of varying degrees of both. Thirty-three cases, or 7.3 per cent, complained only of pain and 13, or 2.77 per cent, complained of bleeding only. Bleeding and pain generally were noted at about the

TABLE VIII. LOCALIZATION OF PAIN

| | |
|----------------------|-----|
| Lower abdomen | 245 |
| Right lower quadrant | 108 |
| Left lower quadrant | 82 |
| Back | 10 |
| Epigastric | 5 |
| Right upper quadrant | 4 |
| Left upper quadrant | 3 |
| Entire abdomen | 3 |
| Left hip | 1 |
| No pain | 13 |
| Painful urination | 29 |
| Painful defecation | 24 |

same time, although one or the other symptom was present for several days prior to the other in a small percentage of the cases.

Pain: The attacks are generally of three kinds. They may be acute without previous symptoms, or there may be a history of mild pain in the abdomen followed by an acute attack, or there may be repeated mild or colicky attacks which finally bring the patient to the physician.

The mild pain is probably due to repeated small hemorrhages into the peritoneal cavity, the colicky to tubal contractions, and the severe to tubal rupture with severe intraperitoneal hemorrhage. In cases where there is a collection of blood in the culdesac, painful defecation is often complained of, but this symptom is also seen in inflammatory pelvic exudates. The pain as noted in the histories was mild, cramp-like, colicky, severe, ripping, tearing, or cutting.

Bleeding: There were three modes of onset of the bleeding. The most common was after a varying period of amenorrhea. The onset of the second type was at the time of the regular menstrual period and lasted periods varying from two and one-half to eight weeks in length. In the third type the bleeding commenced one to three weeks after a normal period. Only 5 patients gave a history of a scant period followed later by spotting. Two patients had lactation amenorrhea and 15 had lost track of the periodicity of their menstruation and complained of irregular bleeding. Eight patients had neither bleeding nor amenorrhea.

The bleeding was profuse only in a small percentage of the cases, most of the patients stating that the amount of bleeding was about the same or less than that of menstruation.

MENSTRUAL HISTORY

In 190, or 43.18 per cent, of the total number of patients and 67 per cent of those who were amenorrheic, the period of amenorrhea was five to six weeks. Of the 13 patients complaining of bleeding only, 3 had tubal ruptures, 1 was unruptured, and 9 had tubal abortions. The points of rupture were very small and there was only a small collection of blood in the pelvis, this probably accounting for the absence of pain.

Of the 33 patients complaining only of pain, 2 were lactating, 6 had had no amenorrhea, and the remaining 25 had had amenorrheic periods ranging from five to twenty-two weeks. In this class there were 26 tubal ruptures, practically all having an acute onset, 1 secondary abdominal pregnancy (five and one-half months), 3 unruptured, and 3 tubal abortions.

Other Symptoms: Symptoms and signs of pregnancy, such as morning nausea and enlargement of the breasts, were conspicuous by their

TABLE IX. MENSTRUAL HISTORY

| LENGTH OF AMENORRHEA | NO. OF CASES | BLEEDING WITH ONSET OF PERIOD | BLEEDING LESS THAN 4 WEEKS AFTER REGULAR PERIOD | NO AMENORRHEA AND NO BLEEDING | HISTORY OF SCANT PERIOD | LACTATION AMENORRHEA | IRREGULAR BLEEDING |
|----------------------|--------------|-------------------------------|---|-------------------------------|-------------------------|----------------------|--------------------|
| 5 weeks | 94 | 66 | 61 | 8 | 5 | 2 | 3 mo. 10 |
| 6 " | 96 | (15%) | (13.86%) | | | | 4 " 2 |
| 7 " | 36 | | | | | | 6 " 3 |
| 8 " | 33 | | | | | | |
| 9 " | 9 | | | | | | |
| 10 " | 10 | | | | | | |
| 11 " | 1 | | | | | | |
| 12 " | 2 | | | | | | |
| 18 " | 1 | | | | | | |
| 22 " | 1 | | | | | | |
| | 283 | | | | | | |
| | (64.3%) | | | | | | |

absence in most cases. Many patients complained of nausea and vomiting but usually after an acute attack of pain.

Fainting and shoulder pain are two symptoms, which, when complained of, aid greatly in making the diagnosis. Fainting occurred one or more times in 132 patients, or 28.91 per cent, and pain in one or both shoulders occurred 28 times. However, 4 patients complained of pain under the breasts and 3 complained of pain under the ribs, making a total of 35 patients, or 7.72 per cent, who had symptoms of subphrenic hemoperitoneum.⁵

Miscellaneous symptoms complained of were: painful urination, 29; painful defecation, 24; nausea and vomiting, 60; chills, 2; complete collapse, 4.

TABLE X. TEMPERATURE AND PULSE RATES

| TEMPERATURE | NO. OF CASES | PULSE RATE | NO. OF CASES |
|--|--------------|---------------|--------------|
| - 97° F. | 3 | - 70 | 1 |
| 97- 98 | 40 | 70- 80 | 68 |
| 98- 99 | 74 | 80- 90 | 84 |
| 99-100 | 195 | 90-100 | 146 |
| 100-101 | 110 | 100-110 | 52 |
| 101-102 | 23 | 110-120 | 65 |
| 102-103 | 4 | 120-130 | 23 |
| 103-104 | 1 | 130-140 | 12 |
| 104- | 1 | 140-150 | 7 |
| | 451 | 160- | 1 |
| | | | 469 |
| Lowest, 96.2 (complete collapse) | | Lowest, 66 | |
| Highest, 104.2 (large infected hematocele) | | Highest, 160 | |
| | | Imperceptible | 4 |
| | | Total | 473 |

TEMPERATURE AND PULSE RATE

Most cases had a slight rise in temperature, the majority having 101° or below. In only 29 patients was the temperature above this figure. The highest, 104.2°, occurred in an infected hematocele, and the lowest, 96.2°, in a case of severe shock with a large intraperitoneal hemorrhage. The temperature range from 99° to 101° occurred in 295, or 65.41 per cent, of the cases.

There is also an acceleration of the pulse rate. It was 100 beats per minute or lower in 299, or 63.19 per cent, of the cases and 110 beats per minute or lower in 351, or 74.18 per cent, of the total number of cases. It ranged from 66 to 160. In 4 cases radial and temporal pulses were imperceptible.

HEMOGLOBIN

Hemoglobin determinations were made in 213 cases, the lowest being 20 per cent and the highest 92 per cent. Sixty-four, or 30 per cent, had less than 50 per cent hemoglobin; in 87, or 40.84 per cent, the hemoglobin estimation ranged from 51 per cent to 70 per cent, and in the remaining cases (62) the percentage was more than 70. However, oftentimes the hemoglobin is not a correct index as to the degree of anemia as this does not drop until twenty-four to seventy-two hours after a hemorrhage.⁶ The Sahli method of hemoglobin determination was used in all cases.

TABLE XI

| HEMOGLOBIN DETERMINATION | | LEUCOCYTE COUNT | | SEDIMENTATION TIME | |
|--------------------------|--------------|-----------------|--------------|--------------------|--------------|
| PER CENT | NO. OF CASES | COUNT | NO. OF CASES | TIME | NO. OF CASES |
| 20-30 | 8 | -5000 | 1 | 10-15 minutes | 2 |
| 30-40 | 18 | 5-10000 | 56 | 15-20 " | 3 |
| 40-50 | 38 | 10-15000 | 67 | 20-25 " | 1 |
| 50-60 | 40 | 15-20000 | 14 | 25-30 " | 3 |
| 60-70 | 47 | 20-25000 | 7 | 30-40 " | 7 |
| 70-80 | 43 | 25-30000 | 6 | 40-50 " | 7 |
| 80-90 | 17 | | | 50-60 " | 3 |
| 90- | 2 | | | 60- | 18 |
| Lowest Hg. | 20% | Lowest | 4400 | Shortest | 10 min. |
| Highest Hg. | 92% | Highest | 28000 | Longest | 118 min. |

LEUCOCYTE COUNT

In 151 cases the leucocyte count was made; the lowest, 4,400, being in a case of unruptured tubal pregnancy, and the highest, 28,000, in an infected hematocele. Counts above 15,000 were not common, though higher counts did not indicate that an infective process was present, as a relative leucocytosis is seen after a severe hemorrhage. The differential count showed nothing distinctive to aid in the differentiation from other conditions though Farrar has called attention to

the fluctuating leucocyte and differential count as an aid in the differentiation of ectopic pregnancy from purulent salpingitis.⁷

BLOOD SEDIMENTATION TEST

The sedimentation test, using the Linzenmeier method,⁸ was used in 44 cases in which the diagnosis was doubtful and observation was necessary. In our experience a sedimentation time of thirty minutes or less denotes an acute inflammatory process, thirty to sixty minutes a subacute process, and sixty, or more, minutes a chronic or noninflammatory process. The sedimentation time was less than thirty minutes in 9, or 20 per cent, of the cases, thirty to sixty minutes in 17, or 38.63 per cent, and more than sixty minutes in 41.35 per cent. In 5 of the 9 cases whose sedimentation time was less than thirty minutes there were large hematoceles, two of which were infected. In another case the appendix was acutely inflamed and involved in the sac.

In our experience thirty minutes as the dividing line has sufficed to aid in the differentiation of acute salpingitis from ectopic pregnancy, as in the former the sedimentation time is less than thirty minutes in 90 per cent of the cases.

ASCHHEIM-ZONDEK TEST

The Aschheim-Zondek test for pregnancy was used in 7 cases, but, preoperatively, only in one. This patient, the five and one-half months secondary abdominal pregnancy, had a positive Aschheim-Zondek test and a positive blood test for female sex hormone by the technic of Frank and Goldberger.⁹ The fetus was alive in this case. In the six other cases, the urine was obtained at the time of operation which was immediate. There were 4 tubal ruptures and 2 tubal abortions. In 5 of these the test was positive, one tubal abortion being negative.

This test is, of course, positive in intrauterine gravidity but when the question of ectopic or some other adnexal condition arises, the Aschheim-Zondek test should prove of value, especially in cases under observation where no definite signs are present by the time the test, which takes one hundred hours, is completed.

PHYSICAL EXAMINATION

The physical findings, both abdominal and pelvic, will depend upon the stage of the pregnancy as the various phases give different signs.

Abdominally tenderness is generally absent in unruptured cases or in early tubal abortion. When there is a small collection of blood, there is usually mild localized tenderness. With a moderate sized collection, as in peritubal hematocele, the tenderness is more marked, and it is acute and diffuse in tubal rupture with severe intraabdominal hemorrhage.

Muscular rigidity is remarkable by its absence, it being present in rare cases. However, voluntary spasm is often present and must not be mistaken for muscular rigidity.

Abdominal distention was seen in 49 cases, a trifle over 10 per cent. It is generally present in cases where there is a great amount of blood in the peritoneal cavity.

Free fluid was noted in 34 cases, all with tubal rupture with severe hemorrhage into the peritoneal cavity.

Pelvis: The signs of pregnancy were absent in the majority of cases. In only 2 was there violaceousness of the vulva noted and a positive Hegar was never obtained. The examination of the uterus is noted in Table XII.

TABLE XII

| NORMAL | SLIGHTLY ENLARGED | DEFINITELY ENLARGED | IN- DEFINITE | SOFT- ENED | MISCELLANEOUS | |
|-----------------|----------------------|------------------------|-----------------|----------------|---|--------|
| 130 (29.54%) | 163 (37.04%) | 57 (12.95%) | 90 (20.45%) | 67 (15.22%) | Acute ante flexion Irregular (10-14 wk. size) | 1 6 |

The adnexal findings are noted in Table XIII.

TABLE XIII

| HARD | "CRUNCH" CLOTS | RESISTANCE | BOGGY (CUL DE SAC) | TUBULAR MASS | ENLARGED ADNEXA | INDEFINITE | FULLNESS IN FORNIX | NO MASS FELT | CYSTIC |
|------|-------------------|------------|-----------------------|--------------|--------------------|------------|-----------------------|--------------|--------|
| 5 | 23 | 33 | 108 | 41 | 9 | 28 | 42 | 14 | 115 |

Under cystic are included all masses described as cystic, elastic, semi-cystic, rounded, or tense. These varied in size from that of a plum to that of a grapefruit.

Definite fluid was felt in the culdesac in 10 cases.

Pulsation of the vaginal vessels was felt in 6 cases.

It is seen that in 223, or 53.35 per cent, of the cases in which there was a description of the pelvic findings, the findings were either cystic or boggy, whereas in 75, or 18 per cent, the findings were either resistance, indefinite, or no mass felt.

Tenderness was a common finding, being absent in only the unruptured cases. When there was any collection of blood the tenderness was exquisite and out of all proportion to the abdominal tenderness.

Jaundice: A definite icteric tinge to the sclerae was noted in three cases, all being large hematoceles.

Colostrum in the breasts was noted only 12 times.

DIAGNOSIS

The absolute diagnosis of ectopic pregnancy except in the "tragic case" is a difficult matter. Threatened or incomplete abortion, reten-

tion cysts of the ovary, and acute adnexal disease give rise to a chain of symptoms which can easily mimic those of ectopic pregnancy. The fact that 36 of these patients had been curetted for the bleeding, prior to admission to the hospital, is an example of the difficulty of making a correct diagnosis early in this disease.

The table of preoperative diagnoses is given below. However, in many cases the pelvic pathology diagnosed was found at operation, but the symptoms were caused by the unsuspected extrauterine pregnancy. Unfortunately it is impossible to include those cases originally diagnosed as ectopic pregnancy in which some other pelvic pathology was found. Could these be included, the percentage of error would be even greater.

TABLE XIV

| PREOPERATIVE DIAGNOSIS | NO. OF CASES |
|---|--------------|
| Ectopic | 249 (58.17%) |
| Ectopic, suspect | 30 |
| Ectopic or incomplete abortion | 8 |
| Ectopic or pelvic inflammation | 7 |
| Ectopic or ovarian cyst | 4 |
| Ectopic or ruptured intestinal ulcer | 1 |
| Ovarian cyst | 17 |
| Acute appendicitis | 8 |
| Abortion, incomplete | 7 |
| Fibromyomas, multiple | 8 |
| Fibroid and intrauterine pregnancy | 1 |
| Acute or subacute salpingitis | 9 |
| Tuberculous salpingitis | 1 |
| Hematocele | 10 |
| Infected hematocele (after observation) | 2 |
| Retroversion, adherent | 1 |
| Dysmenorrhea and ante flexion of uterus | 1 |
| Peritonitis | 1 |
| Uterus didelphys with pregnancy in right horn | 1 |
| Appendicitis and intrauterine gravidity | 1 |
| Undiagnosed | 61 (14.25%) |

Charts incomplete as to diagnosis in 46 cases. Sixty-one undiagnosed cases, several diagnoses were mentioned but operations were all exploratory laparotomies. In 30, or 7 per cent, ectopic pregnancy was suspected. In 20, or 4.67 per cent, the diagnosis lay between ectopic pregnancy and some other pelvic condition. Ten cases, or 2.33 per cent, had large hematoceles. Therefore, in 72.17 per cent of the cases, ectopic gestation was considered but in only 58.17 per cent was ectopic pregnancy the absolute diagnosis.

Immediate operation was performed in 145 cases. The average period of observation in 329 other cases was three and four-tenths days, the shortest being one day, the longest thirty-two days.

Summarizing, ectopic pregnancy must be considered, though its differentiation from incomplete abortion is difficult at this stage, when there is a history of alteration in the menstrual rhythm with bleeding or spotting and abdominal cramps. Where there is fainting and shoulder pain the diagnosis is almost absolute. In addition, if the pelvic examination shows changes coincident with pregnancy and an adnexal mass is felt, ectopic pregnancy is the reasonable diagnosis to make.

OPERATIVE FINDINGS

The operative findings are listed in Tables XV and XVI.

Free and clotted blood was found in most cases except the unruptured tubal pregnancies. In 6 of these, however, there was about one ounce of free blood. In the early tubal abortions there were only a few clots present while free fluid blood was found in the cases of recent rupture.

TABLE XV. ECTOPIC

| PATHOLOGIC FINDINGS | NO. OF CASES | |
|----------------------|--------------|----------|
| Right rupture | 100 | } 37.76% |
| Left rupture | 85 | |
| Right tubal abortion | 127 | } 48.31% |
| Left tubal abortion | 102 | |
| Intraligamentous | 7 | } 2.74% |
| Interstitial | 4 | |
| Isthmic | 9 | |
| Unruptured | 25 | |
| Hematocele | 6 | |
| Secondary abdominal | 9 | |

TABLE XVI. CONCOMITANT PELVIC FINDINGS

| PATHOLOGIC FINDINGS | NO. OF CASES | |
|-----------------------------------|--------------|----------|
| Ovarian cysts { Follicular | 39 | } 10.33% |
| Corpus luteum | | |
| Simple | | |
| Ovarian dermoids | 2 | |
| Ovarian cyst, serous | 1 | |
| Ovarian fibroma | 1 | |
| Parovarian cysts | 5 | |
| Fibromyomata uteri | 11 | |
| Chronic salpingitis | 33 | |
| Hydrosalpinx | 13 | |
| Pyosalpinx | 2 | |
| Ovarian abscess | 1 | |
| Hematosalpinx | 4 | |
| Appendix adherent to ectopic mass | 3 | |
| Umbilical hernia | 1 | |
| Ventral hernia | 1 | |
| Retroflexed uterus | 1 | |

It is seen that 49, or 10.33 per cent, of the cases had inflammatory processes in the other tube.

OPERATIONS PERFORMED

The operations performed are listed in Table XVII. Preliminary posterior colpotomy was performed in 77 cases and curettage in 52. Six cases of pelvic hematocele were treated by posterior colpotomy only. Wherever possible, all the accessible clots and free blood were removed, being left in the abdomen only when the patient's condition did not warrant delay. Convalescence is much more smooth when the blood is removed. Many cases develop alarming postoperative distention when the blood is left in situ.

In the earlier years the peritoneal cavity was irrigated with normal saline but this procedure has long been discontinued. If the patient's

condition warranted the procedure, other pelvic pathology was included in the operative treatment but in the last five years the appendix was not removed if free blood was encountered.

TABLE XVII

| OPERATIONS PERFORMED | NO. OF CASES |
|--|--------------|
| Curettage | 52 (10.97%) |
| Posterior colpotomy | 77 (16.24%) |
| Salpingectomy, unilateral | 244 |
| Salpingectomy, bilateral | 14 |
| Salpingo-oophorectomy | 179 |
| Salpingo-oophorectomy, bilateral | 3 |
| Salpingectomy, partial | 4 |
| Salpingostomy | 10 |
| Resection of ovaries | 20 |
| Posterior colpotomy (only) | 6 |
| Myomectomy | 9 |
| Hysterectomy, complete | 3 |
| Hysterectomy and bilateral salpingo-oophorectomy | 1 |
| Hysterectomy and right salpingo-oophorectomy | 1 |
| Hysterectomy and left salpingo-oophorectomy | 1 |
| Ventral suspension of uterus | 4 |
| Parovarian cystectomy | 5 |
| Appendectomy | 48 |
| Hernioplasty (umbilical, 1; ventral, 1) | 2 |
| Excision rudimentary horn of uterus | 1 |
| Ovariopexy | 1 |
| Salpingectomy, vaginal | 1 |
| Ligation of other tube | 1 |
| *Dudley tracheloplasty | 1 |
| Enterostomy (accidental) | 1 |
| Amputation of cervix | 1 |
| Posterior colporrhaphy | 1 |

*The Dudley tracheloplasty was performed in a case diagnosed as antelexion with dysmenorrhea. Under anesthesia an adnexal mass was felt. Laparotomy was performed and the mass proved to be a tubal abortion.

All cases where posterior colpotomy was performed had a gauze drain inserted into the culdesac. In 12 cases, because of uncontrollable oozing, the pelvis was drained through the culdesac with gauze. Abdominal drainage, cigarette, was used in 9 cases. Pelvoabdominal drainage was used in 6 cases. Drainage, except for uncontrollable oozing, should not be employed and, if used, should be through the culdesac of Douglas.

SECONDARY OPERATIONS

The following secondary operations were performed:

TABLE XVIII

| OPERATION | NO. OF CASES |
|---|--------------|
| Laparotomy with drainage of abdominal abscess due to degeneration and infection of blood left in abdominal cavity | 1 |
| Posterior colpotomy for exudate and pelvic abscess | 6 |
| Revision of infected wound | 3 |
| Suture of posterior colpotomy wound for hemorrhage | 1 |
| Suture of abdominal wall for eventration | 1 |
| Laparotomy for secondary hemorrhage | 1 |
| Colostomy and release of adhesions for intestinal obstruction | 1 |
| Release of adhesions for intestinal obstruction | 1 |

STIMULATION

In recent years, whenever necessary, blood transfusion, either by direct or by the citrate method, has been used. Prior to the standardization of the methods for blood transfusion, stimulation in the form of enemas of coffee, whisky, and caffeine were used together with intravenous saline. In the mild cases Murphy rectal infusions of 5 per cent glucose with subcutaneous saline infusions were given. In cases of severe shock, normal saline was left in the peritoneal cavity, a procedure which was discontinued in later years.

TABLE XIX. BLOOD TRANSFUSIONS

| CITRATE METHOD | UNGER | AUTO-TRANS-FUSION | CANNULA TO CANNULA (DIRECT) | INTRAVENOUS | INTRAVENOUS AND TRANSFUSIONS |
|-------------------|------------|-------------------|-----------------------------|------------------------|--|
| 500 c.c. 14 times | 360 c.c.—1 | 1500 c.c.—1 | 500 c.c.—1 | Saline 250-500 c.c.—23 | Saline 300 c.c. and citrated blood 300 c.c.—1 |
| 600 c.c. 3 times | 450 c.c.—1 | | | | Saline 300 c.c. and citrated blood 500 c.c.—2 |
| 650 c.c. 1 time | 500 c.c.—3 | | | | Saline 500 c.c. and whole blood (Unger) 500 c.c.—1 |
| 700 c.c. 2 times | | | | | |
| | | | | | 1 patient had 2 500 c.c. transfusions |
| | | | | | 1 patient had 700 c.c. preoperative |
| | | | | | 500 c.c. postoperative (sixth day) |

TABLE XX. POSTOPERATIVE COMPLICATIONS

| COMPLICATION | NO. OF CASES |
|--|--------------|
| Pelvic exudate | 38 |
| Pelvic exudate and wound infection | 1 |
| Pelvic exudate and bronchopneumonia | 2 |
| Wound infection | 11 |
| Wound infection and bronchopneumonia | 1 |
| Pelvic abscess | 1 |
| Herpes zoster | 1 |
| Otitis media | 1 |
| Bronchopneumonia | 14 |
| Bronchopneumonia and dilatation of stomach | 1 |
| Bronchitis | 2 |
| Bronchitis (influenzal) | 1 |
| Lobar pneumonia | 8 |
| Lobar pneumonia with pleural effusion and intestinal obstruction | 1 |
| Intestinal obstruction and subphrenic abscess | 1 |
| Cystitis | 1 |
| Mastitis | 1 |
| Pleurisy | 3 |
| Hemorrhage, secondary | 1 |
| Hemorrhage from posterior colpotomy incision | 1 |
| Vesicovaginal fistula | 1 |
| Evisceration | 1 |
| Phlebitis (femoral) | 1 |
| Intraabdominal abscess (?) | 1 |

POSTOPERATIVE COMPLICATIONS

Although pelvic exudates developed 38 times, in only 6 was a secondary colpotomy necessary. The following complications set in post-operatively:

CURETTINGS AND DECIDUAL CAST

Although curettage was done 52 times, in only 23 was a pathologic report obtained as in many cases, no, or hardly any, curettings were obtained.

TABLE XXI

| DECIDUAL CAST | DECIDUAL CAST (INFLAMED) | CURETTINGS | |
|------------------|-----------------------------|---|---|
| 7 | 2 | Hyperplastic endometrium | 2 |
| | | Decidua | 8 |
| | | Decidua (necrotic) | 2 |
| | | Normal endometrium | 5 |
| | | Inflamed endometrium | 1 |
| | | Suggesting early pregnancy (edema and hyperplasia) | 2 |
| | | No evidence of pregnancy | 1 |
| | | Shreds of endometrium | 1 |
| | | Chorion and decidua | 1 |

Nine decidual casts were passed.

In the case reported as chorion and decidua, the laparotomy revealed an early tubal abortion. This is the only case of intra- and extrauterine gravidity in this series.

DEATHS

There were 14 deaths with a mortality rate of 2.95 per cent. In 5 cases the immediate cause of death was the shock and anemia attendant with the severe intraperitoneal hemorrhage. Secondary hemorrhage was the cause of death in two cases. In one case this was proved at secondary operation ten hours after the first. In the other case the patient exhibited all the signs of concealed hemorrhage, was given a transfusion, but died before laparotomy could be performed. Intestinal obstruction was the immediate cause of death in two cases; rupture of the abdominal incision with eventration of the abdominal viscera in one case; pneumonia in three cases; and pulmonary edema and peritonitis in one case.

ANALYSIS OF DEATHS

1. F. L., aged forty-two, with right tubal rupture and severe intraabdominal hemorrhage. She was given 450 c.c. of citrated blood by transfusion. She died the second day postoperative of shock. The patient never rallied despite all stimulation.

2. J. S., aged thirty-three, had a supravaginal hysterectomy with left salpingo-oophorectomy performed with removal of five and one-half months' size fetal sac containing live fetus and placenta. Pelvic drainage through the cervical stump was instituted. She developed intestinal obstruction on the sixteenth day post-operative. The adhesions which had almost completely encircled the sigmoid were released and during this process the sigmoid was accidentally opened into. Col-

ostomy was performed through that opening and the obstruction was completely relieved. Patient developed a left lower lobe pneumonia with a right pleural effusion and ran an extremely high febrile course. She died six days after the second operation. Besides the above, autopsy revealed many loculated abdominal abscesses, and a subphrenic and subhepatic abscess.

3. L. M., aged twenty-six, married eleven months, had a curettage four weeks previous to admission for bleeding. She was operated upon on day of admission at which time a right tubal rupture was found. The abdomen was filled with blood. She was given 650 c.c. of blood by citrate method immediately after the operation; she developed bronchopneumonia and died on fifth day after operation in pulmonary edema.

4. D. M., aged thirty-six, admitted to the hospital in severe shock. She was operated upon immediately without anesthesia. Abdomen was found filled with blood with a right tubal rupture. A right salpingectomy was done. The patient was immediately given 250 c.c. saline intravenously followed by 500 c.c. of citrated blood. Despite all stimulation she died two hours after operation which lasted only ten minutes.

5. E. M., aged thirty-nine, was found to have a rupture of the left tube with secondary abdominal pregnancy with a four months' size fetal sac lying between the uterus, posterior surface of the broad ligament, coils of small intestine, and the sigmoid. Left salpingo-oophorectomy with removal of the sac was performed. There was no drainage. Patient developed intestinal obstruction, was operated upon the third day after operation with the release of adhesions caused primarily by organization of blood clot. She died two days after her secondary operation.

6. E. M., aged thirty-three, was operated upon for right ruptured tubal pregnancy. Posterior colpotomy and right salpingectomy were performed. On the third day postoperative she developed lobar pneumonia and died on the fifth day.

7. Y. K., aged thirty-six, was operated upon for right ruptured tubal pregnancy. Abdomen was found to be filled with blood. Right salpingo-oophorectomy was performed. She was given 300 c.c. of saline intravenously on the operating table followed by a citrate transfusion of 500 c.c. She developed peritonitis and died on the fourth day in pulmonary edema. Cause of death was peritonitis and pulmonary edema.

8. I. R., aged thirty, gave a five-week history of bleeding with the onset of her period. She had had no pain. Pelvic examination revealed a slightly enlarged uterus but no mass. Temperature and pulse normal. After a few days' observation she was curetted. She continued to bleed after curettage, and on the sixth day postoperative while in the ward, she suddenly complained of sharp, excruciating right lower quadrant pain, fainted, and collapsed. She was immediately operated upon. A right tubal abortion was found with many clots and much free blood in the peritoneal cavity. She was given intravenous medication (saline) and also intraperitoneal saline at the time of operation, when a right salpingectomy was performed. Died on the second day postoperative of shock and anemia.

9. R. H., aged thirty-five, married five years, never pregnant. At operation she was found to have a right tubal abortion with secondary abdominal pregnancy. Sac was the size of three and one-half months' pregnancy. A right salpingo-oophorectomy was performed with removal of the sac. Patient did not do well after operation. She exhibited signs of intraperitoneal hemorrhage as evidenced by weak and fast pulse, clammy skin, and air hunger. She was given 500 c.c. blood transfusions by citrate method preparatory to exploratory laparotomy but died before laparotomy could be performed. Death probably due to secondary hemorrhage.

10. E. M., aged twenty-seven, with a right ruptured tubal pregnancy. There

was much blood in the peritoneal cavity. Right salpingo-oophorectomy performed. Died on second day postoperative of bronchopneumonia.

11. G. G., aged thirty-eight, complaining of irregular bleeding of six months' duration. She was curetted by her family physician three weeks prior to admission for the above complaint. Bleeding continued and she entered the hospital at which time pelvic findings revealed only a small left-sided mass. Temperature 102°, pulse 120. She was observed for two days. Exploratory laparotomy was performed at which time left tubal abortion with a right ovarian abscess was found. There were a few old clots in the culdesac. Bilateral salpingo-oophorectomy was performed with pelvic and abdominal drainage. On the fourth day postoperative there occurred a rupture of the abdominal wound with complete eventration of the abdominal contents and a moderate amount of hemorrhage. Closure of the abdomen was immediately performed. She was given intravenous saline but died in shock one day after secondary operation.

12. S. L., aged thirty-seven, with a right ruptured interstitial pregnancy. The abdomen was filled with fluid blood. Right salpingectomy and suture of the uterine horn was performed. She was given intravenous saline and stimulation but died in shock the second day postoperative.

13. B. S., aged twenty-six, entered the hospital in shock, was immediately operated upon and right interstitial rupture was found. Abdomen was filled with fluid blood. Suture of uterine horn and right salpingectomy were performed. Intravenous saline was given. Patient never rallied and died three hours postoperative.

14. K. S., aged thirty-seven, operated upon for left tubal abortion. She also had a right chronic salpingitis. Curettage, posterior colpotomy, bilateral salpingectomy were performed. The patient showed signs of intraperitoneal hemorrhage. She was operated upon ten hours after the first for secondary hemorrhage. She was given intravenous saline and other stimulating medication but never rallied and died one day after operation.

SUMMARY AND CONCLUSIONS

1. Most ectopic pregnancies occur before the age of thirty-five, although they can occur at any stage of sex life.

2. Previous sterility does not seem to be an important factor as only 10 per cent fall into the group classed as primary sterility.

3. Pelvic infection is an important etiologic factor whether an inflammatory, postabortal, or postpartum infection. Especial note should be taken of the greater percentage of "one-child" sterility than primary due undoubtedly to the above factors.

4. The two most common symptoms are pain and bleeding. When coupled with shoulder pain and fainting, the diagnosis is almost absolute.

5. Amenorrhea of five to six weeks followed by bleeding and pain is most common, but a good number of patients had a prolonged period of bleeding with the onset of the period, while many began to bleed one to three weeks after a normal period.

6. The amount of bleeding is less than in threatened abortion, it is darker, generally does not clot. External hemorrhage may be a manifestation of the death of the ovum and occurs when the uterus is beginning to cast off the decidua. Curettings showing only decidua may be pathognomonic of extrauterine gestation.

7. The temperature shows a moderate elevation, rarely above 101° and the pulse rate is proportionately increased, the average being 90 to 110. The leucocyte count is of little value, though a high count does not indicate infection when this is present after severe intra-abdominal hemorrhage.

8. The diagnosis, except in cases with severe hemorrhage, is difficult. In this series only 58 per cent were correctly diagnosed.

9. Any change in the rhythm of the menstrual flow with bleeding and abdominal pain must make one suspect extrauterine gestation.

10. The sedimentation time of thirty minutes or over favors extrauterine pregnancy rather than inflammatory adnexal disease.

11. The Aschheim-Zondek test should prove of value in differentiating adnexal disease from extrauterine pregnancy.

12. Posterior colpotomy should be resorted to in differentiating pelvic abscess from hematocele.

13. Once the diagnosis is made, operation should be immediate except in those cases where hemorrhage has not been profuse and the patient's general physical condition (for example, cardiac status) could be benefited by appropriate preoperative treatment.

14. Blood transfusion, if necessary, should be done and in borderline cases should be performed to shorten the convalescence and aid in restoring the patient more rapidly to her normal status.

15. In this series tubal ruptures were almost as frequent as tubal abortions, 40.50 per cent tubal ruptures and 48.31 per cent tubal abortions.

16. There were 14 deaths or a mortality rate of 2.95 per cent. Five deaths were due to the anemia and shock attendant with severe hemorrhages; two were due to secondary hemorrhage, one to eventration, two to intestinal obstruction, and four to pulmonary complications. Three of the deaths due to primary hemorrhage and one of the deaths due to secondary hemorrhage occurred before the period when blood transfusion, as a therapeutic agent, was available.

I am indebted to Dr. Robert T. Frank for the privilege of reporting this material and for his aid in making this study.

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OBSERVATIONS ON THE VITAL CAPACITY DURING THE LAST MONTH OF PREGNANCY AND THE PUERPERIUM

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IN LOOKING up literature on vital capacity during pregnancy, there seemed to be such a dearth of material on this subject that it was felt some observations taken from the Obstetrical Service of this Hospital might be of value, particularly when considering the prognosis in the case of pregnant women suffering from cardiac lesions.

Bell,¹ in his paper on the vital capacity during pregnancy, states that the literature contains three references to vital capacity during pregnancy: Wintrich,² took vital capacity readings upon 500 women, 52 of whom were pregnant, but no definite conclusions were given upon the effect of pregnancy on the vital capacity.

Zhurakovski,³ wrote upon vital capacity in pregnant and lying-in women, with observations on thoracic measurements during pregnancy. He found that in the largest proportion of cases (66.6 per cent) the vital capacity during pregnancy is less than on the ninth or twelfth day of the puerperium; also that spirometric magnitudes reach their highest values in the puerperium, sometimes between the ninth and twelfth days, but this may not occur until later, depending on the duration of labor as well as on a quick recovery of the breathing muscles and the abdominal pressure.

Root and Root⁴ followed a normal healthy primipara through her pregnancy observing the basal metabolic rate and the vital capacity. In regard to the latter they found a higher vital capacity than the normal standard even two months before delivery, which they felt was probably due to her physical training. The vital capacity curve during pregnancy showed a slight but definite rise from the third to the eighth month. There was a marked increase during the last month. It fell to its earlier level three weeks postpartum. The theoretical reasons given for this were: (a) Increase in the chest volume noted by measurements of the chest circumference and, (b) the lightening before labor. As a supposition the vital capacity measures cardiac power and efficiency and perhaps during the last few weeks of pregnancy the heart truly gathers reserve forces in preparation for the test of labor.

Hasselbach⁵ made observations on a thirty-one-year-old multipara, and with regard to the vital capacity he found that it was slightly greater in the last month than thereafter and considered it due to: (1) more complete emptying of the lungs and, (2) less residual air (quoted from Root and Root).

Wittich, Myers, and Jennings⁶ found that the vital capacity readings were slightly diminished during pregnancy but were the same before and after delivery and rapidly returned to normal during convalescence. They concluded that any influence pregnancy might have was due rather to general weakness than the presence of the enlarged uterus per se.

Bell, from more than 100 readings on approximately seventy cases found that: "Results based upon weight standards are illogical during pregnancy when weight changes are uneven, and in the early stages when nutrition suffers and there is a weight loss. More satisfactory results are obtained in those cases where two or

more readings make possible a comparison of the condition of the heart and lungs at various times. One instance of four readings during the last trimester shows a progressive reduction of the vital capacity accompanying an increase in edema, dyspnea, blood pressure, and nervous instability. In pregnancy as elsewhere excessive reduction in the vital capacity is usually accompanied by heart disease demonstrable clinically. Mechanical factors seem to play a surprisingly small part in vital capacity during pregnancy, as seen in a case of twins with an abdomen which was not small to say the least'' (quoted from Myers⁷).

Klaften and Palugyay⁸ state that the space available for the accommodation of the lungs during pregnancy is less than in the nonpregnant woman. This holds true especially for the lower lobes of the lung. The narrowing of the space is marked on the one hand by the upward pressure of the diaphragm and on the other hand by the decrease in the lateral diameter of the basal section of the air-containing tissue. The functioning of the lungs is, however, greater during pregnancy because, with the rate of breathing, and the vital capacity remaining constant, a greater demand upon the thoracic and diaphragmatic breathing occurs in view of the decreased space. At rest an increased functioning of the thoracic components occurs on standing and in the sitting position; this is especially true during pregnancy. The activity of the diaphragm, especially on deep breathing, is greater than in the nonpregnant woman. The diaphragm on deepest inspiration moves more strongly in the peripheral portion although on deepest expiration it rises very little higher.

Factors other than disease which affect the vital capacity of persons in good health are: (1) Excessive physical training and certain occupations which may result in a greater vital capacity than normal. (2) Age, after forty-five years a steady reduction in vital capacity is noted as age advances. (3) Obesity. (4) Posture. Christie and Beams⁹ found that in a reclining position the vital capacity averaged 5.5 per cent lower than in a sitting position. Rabinowitch¹⁰ found that if the vital capacity, taken in the recumbent position, is multiplied by the constant, 1.075, the product will approximate the vital capacity taken in the standing position. (5) Race and nationality. Foster and Hsieh¹¹ found that the Chinese have a lower vital capacity than the Caucasians. (6) Sex, females have a lower vital capacity than males, so much so that separate normal standards are required.

The influence of disease is best observed with cardiac disease, pleurisy (the vital capacity reduced by pain), pneumonia (which gives the most marked reduction in vital capacity of all), and pulmonary tuberculosis. Other diseases of clinical significance which may cause a reduction in the vital capacity are hyperthyroidism, emphysema, pneumothorax, pulmonary abscess, asthma (following an attack), and pulmonary neoplasms. Old pleural adhesions, deformities of the thorax, malin-gering, and lack of cooperation and will power must also be considered.

Peabody and Wentworth¹² found that when compared to proper standards the vital capacity of healthy persons rarely falls below 90 per cent of the normal standard although it may rise above the normal standard. Patients with heart disease show that there is a close relationship between the decrease of vital capacity and dyspnea. If the cardiac lesion is compensated for and there is no dyspnea, the vital capacity will be found normal. Burton-Opitz¹³ observed fifteen students with definite evidence of heart disease. He concluded that it was only when de-compensation occurred that the vital capacity was markedly decreased.

Dreyer¹⁴ states that if the vital capacity is 10 per cent lower than the calculated normal the patient has some health depressant disease and if 15 per cent lower than the calculated normal, disease is practically certain (quoted from Myers). West¹⁵ felt that a reduction in vital capacity below 70 per cent of the calculated normal is almost always pathologic.

In our series of 60 pregnant women, on whom vital capacity observations were taken during the last month of pregnancy and followed through the puerperium, one of the first factors encountered was to find the most practical method of estimating their normal vital capacity. A large amount of work has been done in regard to this by Peabody and Wentworth, West, Dreyer, and others, and they have found that there is a close correlation between the vital capacity and the surface area of the body. West found that the body surface (in square meters) times 2500 c.c. for men and 2000 c.c. for women more nearly approximated the normal vital capacity than any of the other estimations based on body measurements. In his series 71 per cent were within 10 per cent of normal and 5.5 per cent were 90 per cent of normal.

Meakins and Davies¹⁶ state that in practice this formula of West's provides the simplest and most convenient method of estimating what the normal vital capacity of an individual should be. Lemon and Moersch conclude that West's formula expressed the calculated normal vital capacity the most accurately and simply of any of the methods which they investigated.

The above formula (surface area, in square meters, times 2000 c.c.) was used throughout this investigation and for each case the surface area was calculated from the height and weight using the tables of DuBois and DuBois.¹⁸ Another factor presented itself in regard to the changes in weight during pregnancy. It was suggested that the weight be taken one month to six weeks after delivery, at the final postpartum examination, as this would more accurately represent the normal nonpregnant weight. This was done with each case and the estimated normal vital capacity calculated at this time and compared with all the actual observed vital capacity readings.

Commencing in November, 1927, patients were taken for this series as they presented themselves in the Obstetrical Out-Patient Department of this hospital. However, obese or emaciated patients were not included in this series. In all, 60 patients were observed and followed throughout the latter part of their pregnancy and puerperium. The great majority of these patients did not register in the Out-Patient Department until well advanced in their pregnancy and as a consequence more readings were obtained during the last month of pregnancy. Those registering earlier were so few in number it was felt the results might prove misleading when the vital capacities were grouped and averaged.

On registering, each patient had a thorough physical examination and her vital capacity taken in the standing position with all clothing loosened. The highest of three readings was taken, using the Sanborn water spirometer. In some cases, particularly with those not quick

to grasp the method, the highest of five readings was taken. Care was taken to see that they first expired forcibly and then after the deepest inspiration forced all the inspired air into the spirometer without leakage at the mouthpiece. This was checked by carefully watching that the nickel mouthpiece did not become befogged and also by watching the patient. On each subsequent visit the vital capacity was taken in the above manner. About 2:00 P.M. was the time of day when these observations were taken and patients showing signs of fatigue on arrival were given a rest period before the vital capacity was taken. The ages of these patients were mostly between twenty and thirty. The youngest was seventeen and the oldest forty-three. There were none who showed signs of cardiac damage in this series. However, included separately, there was one patient with severe cardiac damage who died about six weeks postpartum. The vital capacity observations on this patient will be considered later in detail. There were a number of patients registered, not included in this series because of lack of cooperation or intelligence.

Vital capacity observations were taken as soon after delivery as possible with the patient sitting up in bed. A very definite postural effect was noted as the readings were lower with the patient lying down, however, no corrections were made for the readings taken in the sitting position. With all patients having a normal puerperium, they were allowed up on the tenth day and discharged on the fourteenth day. Vital capacity readings were taken daily throughout their stay in the hospital and the final observations made on their postpartum visit, one month to six weeks after delivery.

Following delivery, in the majority of cases, there was a decided drop in the vital capacity readings from that last noted in the antenatal period. This seemed rather to be due to the fatigue following delivery and not necessarily dependent upon the length of the labor or the size of the child. The vital capacity readings steadily rose to the antepartum level and often higher, and in the great majority of cases, more closely approximated their estimated normal, even by the tenth day postpartum. In spite of the fact that the great majority of patients were allowed up on the tenth day postpartum, there was no marked or sudden increase in the vital capacity noted on this day. The average of all these patients was within 10 per cent of the estimated normal on the tenth day postpartum and remained so throughout their stay in the hospital and on their final visits. A few patients all through their pregnancy and puerperium had vital capacity readings well above their estimated normals but these were the exception.

To present all these results as simply and graphically as possible, Fig. 1 was prepared with a horizontal line representing the estimated normal vital capacity for the 60 cases. A vertical line was drawn to

show the time of delivery with spaces on either side indicating the days of the ante- and postpartum periods.

With each case the estimated normal vital capacity was calculated, as previously described, and then the actual observed vital capacity reading for each case was translated into terms of percentage above or below the estimated normal, as the case happened to be, and plotted as such on the chart. The percentage was calculated from the prepared tables of Myers (The Percentage of Vital Capacity—Women—Calculated from the Surface Area).

In the antepartum period the readings were concentrated at definite points: one month, three weeks, two weeks, one week, and one day

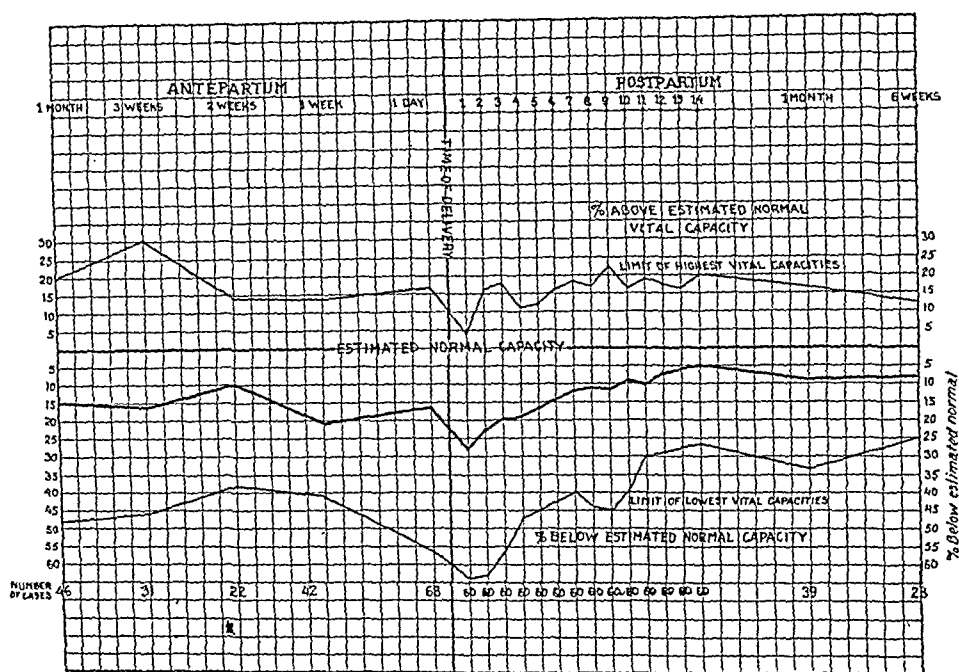


Fig. 1.—The heavy middle line shows the average of vital capacities observed on 60 cases during the last month of pregnancy and the puerperium, expressed in percentage of the estimated normal vital capacity. Each observed vital capacity was plotted in percentage above or below the estimated normal for that particular case, and the average was then taken on the whole series. The upper line represents the limits of the highest vital capacities recorded in this series, and the lower line represents the lowest recorded vital capacities. In the antepartum period at one month the average is that for 46 cases; 31 at three weeks; 22 at two weeks; 42 at one week, and 68 at one day before delivery. This, of course, depended on the regularity with which patients made their antenatal visits. In the puerperium the vital capacities were taken daily on the whole series of 60. One month postpartum 39 patients returned for their final examinations and at six weeks 23 reported. Two patients were referred back at six months thus accounting for the total of 62.

before delivery. This was done so that there would not be a few scattered observations in the intervals between causing a marked fluctuation when these were averaged. Between the two-week antepartum period and the time of delivery these scattered observations were grouped with the majority at the point nearest the time of delivery.

From a perusal of this Fig. 1 it will be seen that for the first two

weeks charted in the antepartum period the average vital capacity lies in the region of -15 per cent until the time of two weeks before delivery when there is a gradual drop until the time of delivery.

Following delivery the average drops rather sharply to -28 per cent with a gradual daily rise back to within normal limits (10 per cent) which is reached by the tenth day postpartum. Following this the average remains within the normal limits throughout the stay in the hospital and also at the final visit.

The average was found by adding all the observations noted above the estimated normal and all those below it and subtracting, in this case, the plus from the minus totals and dividing the result by the total number of observations for that particular day. The average of all these cases is represented in this figure by the heavy black central line. The other horizontal lines, above and below the average represent the highest and the lowest vital capacities registered in this series.

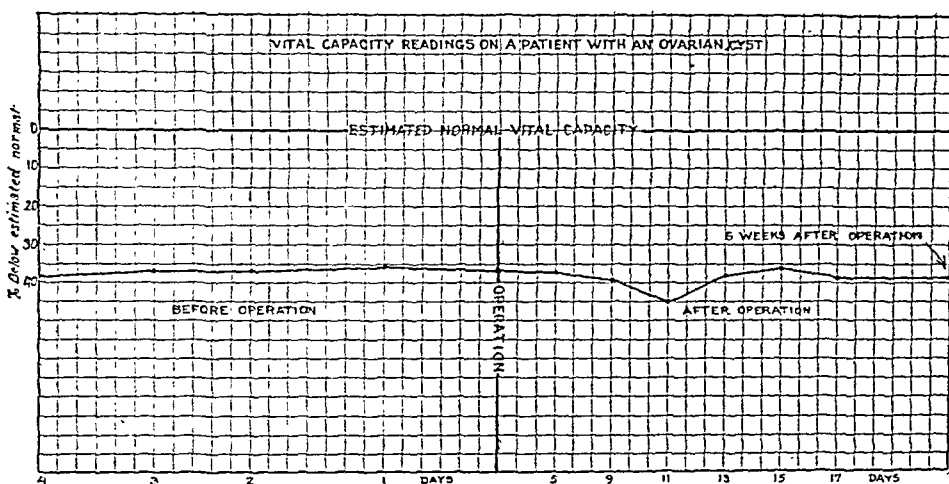


Fig. 2.—This shows the vital capacity expressed in percentage below the estimated normal vital capacity in a case with a large ovarian cyst containing 15,000 c.c. of fluid. Observations were taken on the four days preceding operation and six other observations were taken during her convalescence and a final one on her return at the end of six weeks.

CASE REPORTS

CASE 1.—(No. 22699) *Vital Capacity Observations on a Patient with a Large Ovarian Cyst.*

This patient was a thirty-eight-year-old nullipara who first came to the hospital complaining of an abdominal tumor. She stated that she had first noticed a gradual swelling of the abdomen about four years previously. This gradually increased in size until at the time of admission to the hospital she was markedly distended with a large ovarian cyst.

She was a rather frail woman: height 166.5 cm., weight 64.2 kilos, circumference of abdomen at xiphoid 97.5 cm., circumference of abdomen at umbilicus 107.5 cm.

At operation a large tense ovarian cyst was found filling the greater part of the abdominal cavity. It was necessary to drain it with a trocar before removal and it was found to contain 15,000 c.c. of fluid.

On discharge her weight was 46.4 kilos and on her return six weeks after operation her weight was 49.4 kilos. Using this latter weight to calculate the surface area her estimated normal vital capacity was 3080 c.c. Several observations were made before operation, the highest of which was 1980 c.c. After operation observations were made at intervals throughout her convalescence but there was very little change noted from the readings taken before operation. The lowest observation recorded was 1700 c.c. and the average lay in the vicinity of 1900 c.c. All the observations noted were about a liter below the estimated normal vital capacity. Physical examination of the lungs showed a high level of dullness all round. Liver dullness commenced at the third intercostal space and the area of cardiac dullness was correspondingly moved up. Breath sounds were vesicular throughout. The bases descended on respiration less than 2 cm. On deepest inspiration there seemed to be only very moderate expansion of the thorax in spite of good cooperation. No other factor was found that might have a bearing on this lowered vital capacity.

As can be seen from the chart, the horizontal line representing her vital capacity expressed in terms of percentage runs a fairly even course before and after operation. While conclusions drawn from one case may prove misleading yet it would seem from this particular instance that this large abdominal tumor had very little effect on the vital capacity. Other writers have had similar results. Lemon and Moersch made observations on patients with ovarian cysts and other abdominal tumors and found they had little effect on the vital capacity.

On her final examination, six weeks after operation, her vital capacity was 1900 c.c.

CASE 2.—(No. 694) *Vital Capacity Observations on a Case with Severe Cardiac Damage.*

This patient was registered in the Obstetrical Out-Patient Department November 11, 1927. She was a rather small twenty-two-year-old primipara and her expected date of confinement was January 19, 1928.

During the spring of 1927 she had been on the Gynecological Service of this Hospital complaining of metrorrhagia. On physical examination she was found to have rheumatic heart disease and myocardial insufficiency with associated valvular lesions consisting of mitral insufficiency and stenosis, and aortic insufficiency. A vital capacity observation at this time was found to be 2000 c.c. In the following month she became pregnant and registered on the Obstetrical Service in November. Unfortunately her weight had not been taken before the onset of this pregnancy and as a result it was felt that her estimated normal vital capacity, calculated from the surface area, was not quite accurate. However, the estimated normal, calculated from the surface area was found to be 3020 c.c. as compared with an estimated normal of 3090 c.c. calculated from West's Height Formula ("for every centimeter in height a man gains 25 c.c. of air while a woman gains only 20 c.c. of air"). Her height was 154.5 cm. times 20 equals 3090 c.c. The former estimated normal was used, 3020 c.c., as there was so slight a difference found between them.

Using Myers' tables to calculate the percentage, her first noted vital capacity of 2000 c.c. taken in the spring of 1927, before the onset of pregnancy, was found to be -35 per cent of her estimated normal vital capacity. Subsequent observations were as follows:

| DATE | ACTUAL OBSERVED VITAL CAPACITY | PER CENT BELOW THE ESTIMATED NORMAL |
|---------------|--------------------------------|--|
| Nov. 11, 1927 | 1300 c.c. | -58 |
| Nov. 25, 1927 | 700 c.c. | -80 |
| Dec. 9, 1927 | 1075 c.c. | -68 |
| Dec. 16, 1927 | 1010 c.c. | -69 |
| Dec. 23, 1927 | 1000 c.c. | -69 |
| Dec. 30, 1927 | 900 c.c. | -74 |

At this time she was in labor with marked dyspnea. On January 2, 1928, after a prolonged labor of seventy and one-half hours she was delivered operatively of a 2440 gm. female child, breech extraction (Mauriceau). Her pelvic measurements were normal but her labor was prolonged by irregular labor pains with poor and ineffective contractions, and morphia was administered several times to allow her to obtain several hours' rest. The actual duration of labor was thus considerably shorter than indicated.

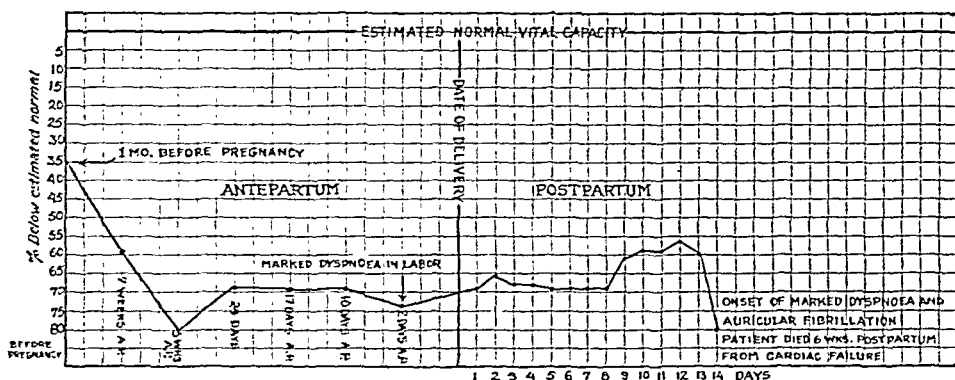


Fig. 3.—This shows the vital capacity expressed in percentage below the estimated normal vital capacity, in a case with severe cardiac damage observed throughout the latter part of pregnancy and the puerperium.

POSTPARTUM OBSERVATIONS

| DATE | ACTUAL OBSERVED VITAL CAPACITY | PER CENT BELOW THE ESTIMATED NORMAL |
|---------------|--------------------------------|--|
| Jan. 2, 1928 | 1000 c.c. | -69 |
| Jan. 3, 1928 | 1100 c.c. | -66 |
| Jan. 4, 1928 | 1050 c.c. | -68 |
| Jan. 5, 1928 | 1050 c.c. | -68 |
| Jan. 6, 1928 | 1010 c.c. | -69 |
| Jan. 7, 1928 | 1010 c.c. | -69 |
| Jan. 8, 1928 | 1010 c.c. | -69 |
| Jan. 9, 1928 | 1225 c.c. | -61 |
| Jan. 10, 1928 | 1300 c.c. | -58 |
| Jan. 11, 1928 | 1300 c.c. | -58 |
| Jan. 12, 1928 | 1350 c.c. | -57 |
| Jan. 13, 1928 | 1200 c.c. | -60 |
| Jan. 14, 1928 | 700 c.c. | -80 |

This was the last observation taken as the patient was too sick to cooperate with the onset of marked dyspnea and auricular fibrillation. She died six weeks postpartum. Permission for autopsy was not granted.

CONCLUSIONS

As a result of these observations it seems fair to state that in the majority of cases there is normally a gradual reduction in the vital

capacity in the last month of pregnancy. This is especially noticeable during the two-week period before delivery. Following delivery there is a fairly sharp reduction in the vital capacity with a gradual return to normal limits which is reached by the tenth day of the puerperium and remains so throughout the following days of the puerperium.

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Sixty per cent or more of patients suffering from dysmenorrhea show stigmas of genital hypoplasia, including infantile uterus. The author studied these cases by means of iodipin injections into the uterine cavity and x-ray films and shows that many uteri called infantile from bimanual examination are actually not infantile in character but show normal uterine cavities on x-ray examination. Conversely many uteri which are called normal bimanually are actually infantile, with definite infantile uterine cavities.

A second group of dysmenorrheic patients show a spasmophilia of all smooth muscle groups including the uterus, and this condition frequently follows severe nervous illnesses. It may occasionally be climactic or psychic in origin. The third group of dysmenorrheics show lesions or changes in the uterine cavity due to injuries of childbirth or abortion. The fourth group is caused by circulatory changes due to and following congenital or acquired blood vessel spasms. The last two groups result from mucous membrane derangements, and uterine and pelvic infection and inflammation. Narrowing or stricture of the cervical canal is rarely a cause of dysmenorrhea.

In patients with infantile uteri, the latter should be packed with gauze. Cervical dilatation relieves these cases for several menstrual cycles. In those patients with vasomotor disturbances, temporary relief can be obtained by exerting pressure on the abdominal aorta.

RALPH A. REIS.

FURTHER OBSERVATIONS ON THE GASTRIC JUICE IN PREGNANCY

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TOXIC or severe vomiting of pregnancy is now being treated with constantly improving results and in the past few years mortality from this cause has greatly decreased. Abortion is being discouraged, except as a life-saving measure, and the use of glucose, saline, nasal feedings is on the increase.

Today, toxic vomiting of pregnancy is recognized not as a sudden, specific toxemia, but an entity which originates with "morning sickness" and gradually becomes worse due to starvation and dehydration. Much work has been done to overcome this end result, while serious treatment in the early stages of the condition has been neglected. If we had some uncomplicated way to prevent nausea and vomiting of pregnancy at the very first or, if already it had started, we could quickly stop it, is it not probable that in a majority of cases the more serious toxemias could be prevented?

Kehrer, in 1905, reported the examination of the stomach contents during pregnancy. His findings suggest that there is a decrease in the amount of gastric hydrochloric acid, which he considers usual. His work precedes the introduction of the Rehfuß tube and the present-day fractional method of analysis. A publication by Tetsutaroo Nakai in the *Tokio Journal of Biochemistry* in October, 1925, came to our attention about a year after this work was started and presented practically the same findings reported in our first article. Nakai's work consisted of the study of the gastric juice in six cases, during the first five months, and eight cases during late pregnancy. From this work he concluded that the free acid and total acid of the gastric contents are lower and that this deficiency was more marked during the first five months.

A study of the gastric contents is naturally suggested by certain observations. A woman, during early pregnancy, may rise in the morning feeling nauseated, and after a short time vomit; a typical case of "morning sickness." After vomiting, however, she may eat a hearty breakfast without the slightest discomfort, and may not be nauseated the remainder of the day. Would this not suggest that possibly something in the fasting stomach was responsible for the nausea and vomiting, and that not until the stomach had emptied itself of its undesirable contents was it prepared to receive food? For some time it

has been known and practiced that dry feedings before getting out of bed in the morning will prevent "morning sickness" in certain cases. Is it possible that by such feedings, secretions can be stimulated or the stomach contents altered in some way to prevent gastric discomfort?

The pregnant women to be examined was instructed to eat nothing after 6 P.M. the day before, and to drink nothing after 6 A.M. the next day, when between nine and ten o'clock she swallowed a Rehfuß stomach tube, through which all of the stomach contents were removed. The tube was allowed to remain in the stomach, and was fastened with adhesive tape so that it could neither slide farther down or be pulled out. She then ate a test meal consisting of a shredded wheat biscuit and 300 c.c. of water. Fractions of approximately 10 c.c. were removed forty-five, sixty, and seventy-five minutes after the patient actually started eating the meal. Five or 10 c.c. of each sample were examined quantitatively by Toepfer's method for free hydrochloric acid and using phenolphthalein as an indicator for total acid, titrating against tenth normal sodium hydroxide. Only cases in which the tube was inserted with comparative ease were considered. The existing nausea and vomiting in some instances made it difficult for the patient to swallow the tube, and when any difficulties were encountered, such cases were not used.

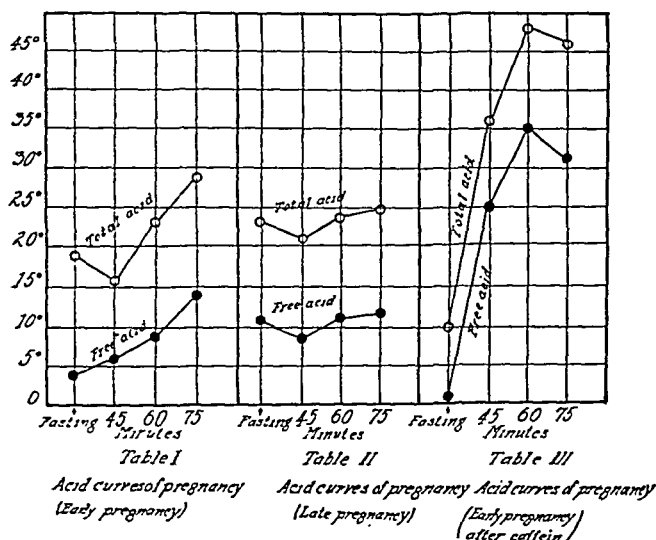
The results of this work were given in a previous paper, together with the determination of gastric chlorides in eight cases in which the total chlorides were normal or even increased. In the present paper, we wish to report on the chloride contents in the stomach of 20 additional pregnant women. The chloride values are expressed in milligrams per 100 c.c. of gastric juice. Water alone, or both water and shredded wheat were used as a test meal. These findings, according to Alvarez, would suggest a reversal of the intestinal gradient with regurgitation of alkaline duodenal material into the stomach, thereby neutralizing the acid. The reversal is probably due to a reflex resulting from hyperemia and congestion of the early pregnant uterus. Since an apparently normal acid curve is obtained following the test meal, this type of achlorhydria would be classified by Apperly as relative. Alvarez and Hosoi in a recent paper, working on pregnant rabbits, found that the gradient in irritability was flattened in some of the animals and reversed in others. The gradient of the latent period was always reversed. Conduction was somewhat changed in that waves moving orad traveled a little faster than those moving caudad. In sickly animals some gradients were reversed or flattened, while others remained normal. It is suggested that the reversal of gradients may be present in pregnant women and that it may account for some of their nausea and vomiting.

The series which was reported at first was based on 29 cases. We are presenting here our results in 50 cases, including the cases of the

first series. Practically all of these patients suffered from nausea and vomiting. The following very interesting facts were observed:

First, that free hydrochloric acid in all cases was decreased, and that this decrease was more marked during the early months when nausea and vomiting are more frequent.

Second, that 29 patients in the first three months had a total absence of hydrochloric acid. The total acid was decreased in proportion to the free acid. Table I shows the average gastric curve obtained in 35 cases of pregnancy during the second and third months. In all of these instances a test meal consisting of a shredded wheat biscuit and 300 c.c. of water was used. Table II in contrast, shows the average gastric curve obtained from six pregnant women from the fifth to the eighth month,



who earlier in pregnancy had been examined and had shown a total absence of hydrochloric acid in the fasting stomach.

Third, that in spite of the hypochlorhydria, the total chlorides in the fasting contents were normal or even increased. In an attempt to correct such an acidity and to determine if in that way nausea and vomiting could be eliminated, a series of patients were given ten to fifteen drops of dilute hydrochloric acid before meals. Some marked improvements were reported. It was found, however, that due to the already existing nausea, it was very disagreeable to take the acid, and this sometimes itself caused vomiting. A short time ago a more desirable product from the standpoint of administration was called to our attention. Muriatogen, a coated tablet consisting of a synthetic silicate which dissolves readily in water and releases the equivalent of ten minims of dilute hydrochloric acid, can very readily be taken. Possibly with such a preparation the undesirable use of hydrochloric acid can be overcome.

About two years ago, W. Morrell Roberts called attention in England to the stimulating action of caffeine on gastric secretion. He was able to demonstrate, even after paralyzing the vagus with atropine, that three grains of caffeine by mouth stimulated the secretion of hydrochloric acid in a very short time. As a result of this, we used three grains of caffeine citrate and 50 c.c. of water as a test meal and we have shown that hydrochloric acid is secreted within fifteen minutes and reaches the greatest concentration in the stomach within approximately one-half hour.

Table III shows the average gastric curve obtained in 10 cases in which 3 grains of caffeine citrate and 50 c.c. of water were used as a test meal and fractions removed every fifteen minutes. The curve indicates an immediate marked increase in the total and the free hydrochloric acid, suggesting a stimulating effect from the caffeine. We have now stopped giving the rather disagreeable hydrochloric acid and are beginning observations on the clinical effects of the use of caffeine citrate to bring about an increase in acid secretion. The caffeine citrate may not only act as a direct stimulant on gastric secretion, but may have an effect on the nervous mechanism of the gastrointestinal tract, restoring the normal downward gradient.

CONCLUSIONS

1. We wish to further emphasize the conclusions of our first paper, that free hydrochloric acid and total acid of the stomach contents are lower in pregnancy than in the nonpregnant and that this deficiency is more marked early, at the time nausea and vomiting are most common.

2. This absence of free acid is due to the fact that it is neutralized most likely by a regurgitation of the alkaline duodenal contents into the stomach.

3. Caffeine citrate in these cases has a marked ability to cause an increased secretion of hydrochloric acid.

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CONTRACTED PELVES AND DISPROPORTION*

A REPORT OF FOUR HUNDRED AND SEVENTY-ONE CASES

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DYSTOCIA due to contraction of the pelvic canal, or to disproportion between a normal pelvis and a baby is one of the most interesting and vital problems in the management of obstetrics. A contracted pelvic canal in itself is not inimicable to a normal delivery. It becomes of importance when the individual contraction presents a difficulty to the delivery of the individual baby. In other words the size of the child, and the gauge is usually the size of the child's head, as compared with the diameters of the pelvic canal which it must traverse during labor is the real criterion of disproportion. This holds true whether the pelvic canal is normal or contracted.

During the five-year period from January 1, 1924, to January 1, 1929, there were 9074 deliveries at the Royal Victoria Montreal Maternity. The pelvis and the child were studied in 5782 cases. In this latter group there were 471 cases in which either contraction of the pelvic canal or disproportion between a normal pelvis and a child was present, an incidence of 8.11 per cent. Of this number 220 or 46.7 per cent of the patients delivered spontaneously, and 251 or 53.3 per cent of the patients required some operative interference. (See Table I.)

To simplify the classification of these cases as much as possible they have been divided into four major groups: (a) the flat pelves, (b) the generally contracted pelves, (c) the masculine pelves, and (d) the diseased pelves, and the normal pelves with a large child. To these groups there has been added a fifth group, a group in which the pelvic measurements are not complete in all details but in which there was enough disproportion present to require some operative interference.

FLAT PELVES

The simple flat and the rachitic flat pelves have been included in this group of 196 cases. The external conjugate ranged from 20.5 cm. to 16.5 cm. The conjugate vera was never more than 10.5 cm. There are 52 primiparae and 144 multiparae. Spontaneous delivery occurred in 111 or 56.63 per cent of the cases, and operative interference was required in 43.37 per cent of the cases. The number of spontaneous deliveries however should be corrected from 111 to 128 as 17 additional cases had induction of labor which terminated as normal spontaneous deliveries.

*Read before the Philadelphia Obstetrical Society, Meeting of March 6, 1930.

TABLE I

NO. OF PATIENTS DELIVERED 1924-1929
 NO. OF PATIENTS STUDIED
 NO. OF CASES SHOWING PELVIC CONTRACTION OR DISPROPORTION
 NO. OF CASES DELIVERING SPONTANEOUSLY
 NO. OF CASES REQUIRING OPERATION

9074
 5872
 471
 220
 251

| TYPE OF PELVIS | NO. OF CASES | METHOD OF OPERATIVE PROCEDURE | | | | | | | | | | | | | | | | MORTALITY | |
|--------------------|--------------|-------------------------------|----------|-----------|----------|-----------|----------|----------|----------|------------------------|----------|----------|----------|------------|----------|----|---|-----------|----------|
| | | DELIVERY | | OPERATIVE | | INDUCTION | | FORCEPS | | VERSION AND EXTRACTION | | CESAREAN | | CRANIOTOMY | | | | | |
| | | SPONTANEOUS | | | | | | | | | | | | | | | | FETAL | MATERNAL |
| | | PER CENT | PER CENT | PER CENT | PER CENT | PER CENT | PER CENT | PER CENT | PER CENT | PER CENT | PER CENT | PER CENT | PER CENT | PER CENT | PER CENT | | | | |
| | | | | | | | | | | | | | | | | | | | |
| Gen. Contracted | 72 | 52 | 72.8 | 20 | 27.2 | 4(+ 2) | 30.0 | 8 | 40.0 | 7 | 8.2 | 8 | 40.0 | 4 | 4.7 | 4 | | | |
| Flat | 196 | 111 | 56.7 | 85 | 43.3 | 17(+ 3) | 23.6 | 16 | 18.8 | 2 | 3.4 | 41 | 48.2 | 1 | 1.7 | 23 | | | |
| Masculine | 113 | 55 | 48.7 | 58 | 51.3 | 5(+ 7) | 20.6 | 32 | 55.1 | 3 | 6.6 | 18 | 31.0 | 9 | 20.0 | 9 | | | |
| Diseased | 47 | 2 | 4.0 | 45 | 96.0 | 2(+ 4) | 13.3 | 9 | 20.0 | 2 | 4.6 | 15 | 48.8 | 1 | 2.3 | 11 | | | |
| “Disproportion” | 43 | 0 | 0 | 43 | 100.0 | 7(+ 5) | 27.9 | 18 | 41.8 | 14 | 5.5 | 104 | 41.4 | 15 | 5.9 | 4 | 2 | | |
| Total | 471 | 220 | 46.7 | 251 | 53.3 | 35(+21) | 22.3 | 83 | 33.0 | 7 | | 3 | | 15 | | 51 | 2 | | |
| Fetal Mortality | 51 | 11 | | 39 | | 1(+ 3) | | 14 | | | | | | 1 | | | | | |
| Maternal Mortality | 2 | | | | | | | 1 | | | | | | | | | | | |

The proportion of low forceps to spontaneous deliveries is 5 to 128 or 1 to 25, and is not greater than the average. There are nine cases of mid forceps, all due to disproportion and all the patients with average sized children. The fetal mortality in this group is high, 44.4 per cent. There are two cases of high forceps, one in a primipara with a small baby and long labor, and the other in a multipara with an average baby and a short labor. The infant was lost in the latter case.

Cesarean section was done in 41 patients: 8 of them had had previous sections and two of them had a test of labor. The only fetal mortality in this series was due to pulmonary atelectasis.

Four of the seven patients of version and extraction had babies above the average weight. The operative indications were: anacephalus 1, prolapsed cord 2, transverse presentation 2, and prophylactic 2. Only one of the children survived, one of the two cases of transverse presentation.

Craniotomy was done in three cases. One was for a right mento-posterior presentation, a second for a left mentoanterior presentation, and the third for an impacted right occipitoposterior presentation. Embryotomy was done only once and in that instance for an impacted right occipitoposterior presentation with a very large child, in a multipara with a conjugate vera of 8.5 cm.

Induction of labor was done in 19 cases. Spontaneous delivery occurred in 17 of the cases and only two required further operative treatment, both being delivered by mid forceps. In every case the induction was done at the eighth or the eighth and a half month of the pregnancy. There was one fetal death, and that was due to intracranial hemorrhage.

The prognosis for a spontaneous or an operative delivery depends somewhat upon the degree of contraction, which may be divided into the minor, medium, and major degree. (See Table II.)

TABLE II. FLAT PELVIS. DEGREE OF CONTRACTION AND METHOD OF DELIVERY

| | NO. OF CASES | SPONTANEOUS | INDUCTION | LOW FORCEPS | MID FORCEPS | HIGH FORCEPS | CESAREAN SECTION | VERSION AND EXTRACTION | CRANIOTOMY, ETC. | PER CENT DIFFICULT |
|---------------|--------------|-------------|-----------|-------------|-------------|--------------|------------------|------------------------|------------------|--------------------|
| Minor Degree | 16 | 12 | | | | | 2 | | 2 | 25.0 |
| Medium Degree | 136 | 90 | 12 | 4 | 7 | 1 | 18 | 5 | | 33.8 |
| Major Degree | 44 | 9 | 7 | 1 | 2 | 1 | 21 | 2 | 2 | 79.5 |

The minor degree includes those cases with a conjugate vera of 10.5 cm. The prognosis for spontaneous delivery is good, only 25 per cent of the cases requiring operative interference. The medium degree includes those patients with a conjugate vera of from 9 to 10 cm. Prognosis for spontaneous delivery is again good but 33.82 per cent

of the patients required operative interference. The major degree includes those cases with a conjugate vera of 8.5 cm. or less. The prognosis for spontaneous delivery is poor as 79.54 per cent of the patients required operative interference.

GENERALLY CONTRACTED PELTS

The second group contains 72 patients, 23 primiparae and 49 multiparae. The external conjugate ranges from 18 to 15.5 cm. and the conjugate vera again is never more than 10.5 cm.

Spontaneous delivery occurred in 52 or 72.22 per cent of the cases. This is a considerably higher percentage than in the flat pelvis. Only 27.78 per cent or 20 of the patients required operative interference.

The necessity for low forceps is only average, 1 to 18. In one case, a multipara had been in labor for ninety-three hours with an average sized child; the child was stillborn, the fetal death being due to intracranial hemorrhage. Mid forceps were done in five patients, in four of whom the labors had been longer than the average, and the children of average size. Two of the cases had been induced at the eighth and a half month of the pregnancy.

Induction was done in four other patients, all of them delivering spontaneously, making the corrected number of spontaneous deliveries 56.

The only other operative procedure in this group was cesarean section, which was done in eight cases. Two of the patients had a test of labor. One of these patients was a primipara who had an induction of labor by means of a Voorhees bag at the eighth and a half month, and after a satisfactory test of labor had a cesarean section. There was one fetal death, due to icterus neonatorum.

The prognosis for spontaneous delivery in the minor and medium degrees of contraction is good as only 26.66 per cent of the former and 18.6 per cent of the latter required operative interference. In the major degree, however, the prognosis is only fair as 42.85 per cent of the patients required operative interference. The type of operative procedure required for each of the degrees of contraction is shown in Table III.

TABLE III. GENERALLY CONTRACTED PELVIS. DEGREE OF CONTRACTION AND METHOD OF DELIVERY

| | NO. OF CASES | SPONTANEOUS | INDUCTION | LOW FORCEPS | MID FORCEPS | HIGH FORCEPS | CESAREAN SECTION | VERSION AND EXTRACTION | CRANIOTOMY, ETC. | PER CENT DIFFICULT |
|---------------|--------------|-------------|-----------|-------------|-------------|--------------|------------------|------------------------|------------------|--------------------|
| Minor Degree | 15 | 12 | 1 | 1 | 2 | | | | | 26.6 |
| Medium Degree | 43 | 36 | 4 | 2 | 2 | | 3 | | | 18.6 |
| Major Degree | 14 | 8 | 1 | | 1 | | 5 | | | 42.8 |

MASCULINE PELTS

The masculine pelvis has in addition to its other well-known characteristics, a contraction of the pelvic outlet. There are 113 patients in this group, 76 primiparae and 37 multiparae. They have been subdivided according to the narrowing of the pelvic outlet as demonstrated by the distance between the ischial tuberosities. The maximum diameter is 7.5 cm.

TABLE IV. MASCULINE PELVIS. DEGREE OF CONTRACTION AND METHOD OF DELIVERY

| | NO. OF CASES | SPONTANEOUS | INDUCTION | LOW FORCEPS | MID FORCEPS | HIGH FORCEPS | CESAREAN SECTION | VERSION AND EXTRACTION | CRANIOTOMY, ETC. | PER CENT DIFFICULT |
|---------------|--------------|-------------|-----------|-------------|-------------|--------------|------------------|------------------------|------------------|--------------------|
| Minor Degree | 77 | 46 | 8 | 13 | 9 | 2 | 5 | 2 | | 44.0 |
| Medium Degree | 28 | 13 | 3 | 5 | 2 | | 7 | | 1 | 58.1 |
| Major Degree | 8 | 1 | 1 | 1 | | | 6 | | | 87.5 |

Fifty-five or 47.78 per cent of the patients were delivered spontaneously. The corrected number of spontaneous deliveries is 60, as five cases having surgical induction terminated as spontaneous deliveries. The proportion of low forceps to spontaneous delivery is much higher than normal, 1 to 3; this is also true of the mid forceps, 1 to 5. There are 19 instances of the former with one fetal death due to congenital heart disease and 11 of the latter with two fetal deaths due to intracranial hemorrhage. Two patients required high forceps, both having average sized babies.

Eighteen of the patients required cesarean section, three of them having a test of labor, and three others having had previous sections. The one fetal mortality was due to intracranial hemorrhage occurring as a result of trauma during the operation.

Version and extraction was done in two cases, and both were prophylactic.

The craniotomy was done for hydrocephalus.

Induction of labor was performed in 12 cases: five patients delivered spontaneously and seven or 58.33 per cent of the patients required further operative interference. This is much greater than in the flat and generally contracted pelves.

It is interesting to note that in the 95 patients that were delivered by the pelvic canal there were 10 complete tears, an incidence of 10.52 per cent, which is higher than the normal. The average incidence of complete tears for the Royal Victoria Montreal Maternity Hospital clinics is 1.3 per cent.

The degree of contraction of the outlet may be divided into minor, medium, and major degrees. The minor degree includes those patients with a transverse of the outlet of 7.5 cm. The prognosis for spon-

taneous delivery is fair, as 44.75 per cent of the patients required operative procedures.

The medium degree includes those patients with a transverse of the outlet of from 6.5 to 7 cm. The prognosis for spontaneous delivery is poorer than in the minor degree as 57.15 per cent of the patients required operative procedures. The major degree of contraction includes those patients with a transverse of the outlet which is 6 cm. or less. Operative procedures were required in 87.5 per cent of this group and the prognosis for spontaneous delivery is therefore poor. (See Table IV.)

DISEASED PELVES

This group of 47 cases includes three large subdivisions, (a) disease of the bony pelvis, (b) disease of the pelvic organs, and (c) disease of the child.

Disease of the bony pelvis occurred in 28 patients. There are 14 cases of atypical pelvis including the Robert, the Naegele, and the obliquely contracted pelvis due to rachitis. The other 14 cases consist of old fractured pelvis, hip joint disease, pelvic osteoma, and prominent ischial spines. In the entire group only two patients delivered themselves spontaneously.

Six patients required low forceps, two of the infants were lost; three patients required mid forceps. The proportion of forceps deliveries to spontaneous deliveries is much greater than normal, 3 to 1. Version and extraction was done in three patients. In all three the operation was done as a prophylactic measure.

Craniotomy was done in three patients, the indications being as follows: impacted left occipitoposterior, impacted right occipitoposterior, and an impossible pelvis with a dead child.

Ten patients required cesarean section, two of them having had a test of labor.

Diseases of the pelvic organs were present in eleven cases. None of the patients delivered spontaneously. In eight of the cases the pelvic canal was obstructed by fibromyomas of the uterus, and delivery was accomplished by elective cesarean section. Ovarian cysts were present in two cases, one being delivered by cesarean section and the other by craniotomy after a prolonged labor. One case had had a previous Watkins interposition operation for cystocele. She was delivered by cesarean section and sterilized.

Hydrocephalus occurred in six patients with normal pelves. One case delivered spontaneously and five were delivered by craniotomy. There were two cases in which the pelves were normal, but the children were large and when Müller's test was used the head would not enter the pelvic inlet. Both patients were delivered by elective cesarean section.

DISPROPORTION, PELVIC MEASUREMENTS INCOMPLETE

This group includes 43 patients, 19 primiparae and 24 multiparae, in whom the pelvic measurements are not complete in all details; i.e., the diagonal conjugate is not given, or is recorded as "not reached." These cases were private cases of the staff. All of the patients presented definite disproportion clinically and all of them required some operative interference.

Eighteen of the patients were delivered by forceps: 6 with low forceps, 7 with mid forceps, and 5 with high forceps. There were two deaths, both due to intracranial hemorrhage. There was one maternal fatality due to septicemia.

Fifteen patients had elective cesarean section. Version and extraction was done in two cases, one for a prolapsed cord following a bag induction, and the other one for a transverse presentation, the latter child dying from intracranial hemorrhage.

Induction of labor at the eighth or the eighth and a half month was done in 13 cases. Seven of the patients or 53.85 per cent delivered spontaneously, and six or 46.15 per cent required further operative treatment. One patient was delivered by version and extraction, two required low forceps, one mid forceps, and one high forceps. One patient was delivered by craniotomy. This patient was a primipara, aged twenty, with a small but otherwise normal pelvis and a large baby. She was eight and a half months pregnant, and by abdominal examination the head was found floating above the brim. By Müller's test it was thought that the head would enter the pelvis. An induction of labor by means of a bougie was done. The pains were very inefficient and after a labor of eighty hours the cervix was dilated only 3 cm. The fetal heart became poor. A manual dilatation of the cervix was done and a high forceps attempted, but failed. A cranioclast was then used and the delivery completed. The patient became markedly toxic within a few hours. The temperature was subnormal, the circulation began to fail, and in spite of blood transfusion and other remedies the patient died the day following delivery. She had a very virulent streptococcic infection.

FETAL MORTALITY

There were 51 fetal deaths in the 471 cases, the mortality percentage from all causes being 10.82 per cent. The four major causes were: (a) intracranial hemorrhage, (b) destructive operations, (c) prolapse and other conditions of the cord, and (d) prematurity and other diseases of the newborn.

Intracranial hemorrhage occurred in 17 cases. Four of the patients delivered spontaneously, 3 were delivered by version and extraction, 9 were delivered by forceps, and one by cesarean section. Fetal intra-

cranial hemorrhage occurred in 3.65 per cent of all cases and was responsible for 33.3 per cent of the fetal mortality.

Destructive operations were done in 15 cases: 6 of them or 40 per cent were craniotomies for hydrocephalus, 8 or 53.33 per cent were craniotomies for impossible deliveries, and one or 6.67 per cent was an embryotomy for an impossible delivery. These operations occurred in 3.18 per cent of all cases and were responsible for 29.4 per cent of the fetal mortality.

Prolapse of the cord occurred in 6 cases and in one other case the cord was so tightly wound around the shoulder that it caused a fatal termination. These complications caused 13.7 per cent of the infantile mortality and occurred in 1.48 per cent of the series of cases.

Six of the fetal deaths were due to prematurity and 6 others to diseases of the newborn, not due to or a result of the labor. These conditions occurred in 2.54 per cent of all cases and caused 23.5 per cent of the fetal mortality.

The causes of the fetal deaths and the method of delivery for the entire series of cases is shown in Table V.

OPERATIONS

Operative interference was required in 251 or 53.3 per cent of the 471 cases. Forty of the fetal deaths or 78.4 per cent of the fetal deaths occurred in this group. (Table I.)

Induction of labor was done in 56 cases or 22 per cent of the operative cases. Spontaneous delivery occurred in 35 or 63.59 per cent of the cases. Further operative procedure was required in 21 or 36.41 per cent of the cases. Four fetal deaths occurred in this group, an incidence of 7.14 per cent which is slightly below the average, 10.82 per cent, for the series.

In every instance the induction of labor was preceded by an examination of the patient under anesthesia, using the Müller test to determine whether or not the fetal head would enter the inlet. If the head entered the inlet easily, an induction of labor was done. If the head entered with some difficulty and if in the opinion of the examiner, the patient could be delivered of a living child by the vaginal route, an induction of labor was done. If in his opinion, the patient could not be delivered of a living child by vaginal route an elective cesarean section was performed. If the head did not enter the inlet at all the patient was delivered by elective cesarean section.

The forceps were used in 83 cases or in 32.6 per cent. There were 14 fetal deaths with this method of delivery, an incidence of 17.8 per cent which is higher than the average for the series. There was one maternal death, and that was due to streptococcic septicemia.

Version and extraction was done in 14 cases or 5.5 per cent of the series. Seven or 50 per cent of the children were lost. In 7 of the cases,

TABLE V—Cont'd

| METHOD OF DELIVERY | NO. OF CASES | PARITY | NO. OF FETAL DEATHS | CAUSE OF FETAL DEATH | | | | | | | | | | FETAL ATELECTASIS | DISPROPORTION- MALPOSITION |
|---------------------------|--------------|--------|---------------------|----------------------------|----------------|-----------------------------|-----------|---------------|-------------|-------------------------|-----------------------------|-------------------------|-----------------------|----------------------|-------------------------------|
| | | | | INTRACRANIAL HEMORRHAGE | PROLAPSED CORD | CORD TIGHT OVER SHOULDER | PREMATURE | HYDROCEPHALUS | ANACEPHALUS | PREMATURE SEPARATION | CONGENITAL HEART DISEASE | DIAPHRAGMATIC HERNIA | ICTERUS NEONATORUM | | |
| INDUCTION | | | | | | | | | | | | | | | |
| Spontaneous | 13 | P | 1 | 1 | | | | | | | | | | | |
| | 22 | M | | | | | | | | | | | | | |
| Low Forceps | 6 | P | 1 | | | | | | | | 1 | | | | |
| | 2 | M | | | | | | | | | | | | | |
| Mid Forceps | 4 | P | | | | | | | | | | | | | |
| | 2 | M | | | | | | | | | | | | | |
| High Forceps | 1 | P | | | | | | | | | | | | | |
| | 1 | M | | | | | | | | | | | | | |
| Version and Extraction | 1 | P | | | | | | | | | | | | | |
| | 4 | M | 1 | | 1 | | | | | | | | | 1 | |
| Craniotomy | 1 | P | 1 | | | | | | | | | | | | |
| | | M | | | | | | | | | | | | | |
| Premature (Not Inductive) | 4 | P | 1 | | | | 1 | | | | | | | | |
| | 9 | M | 4 | | | | 4 | | | | | | | | |
| Breech (Easy) | 4 | P | | | | | | | | | | | | | |
| | 6 | M | | | | | | | | | | | | | |
| Twins | 1 | P | | | | | | | | | | | | | |
| | 2 | M | 1 | | | | 1 | | | | | | | | |
| Total | 471 | | 51 | 17 | 6 | 1 | 6 | 6 | 1 | 1 | 1 | 1 | 1 | 1 | 9 |

the operation was done as a prophylactic measure, two of the infants dying from intracranial hemorrhage, a mortality of 28.5 per cent. Transverse presentation was responsible for 3 other operations, only one child surviving, the other two dying from intracranial hemorrhage. Prolapse of the cord occurred three times; one of the infants survived. Anacephalus occurred once, and as the infant was a monstrosity it did not survive. Therefore of the 7 cases in which emergency version and extraction was done, 5 children were lost, a fetal mortality of 71.4 per cent. If the monstrosity is excluded, the mortality rate is 66.6 per cent.

Cesarean section was done in 104 cases or 41.4 per cent of the operative cases, nine of the patients having had a test of labor. There were three fetal deaths, an incidence of only 2.8 per cent. There were no maternal deaths from cesarean section.

Craniotomy was done in 14 cases or 5.5 per cent of the operative cases. There was one maternal death; she had had an induction of labor done. Embryotomy was done once.

SUMMARY

1. There are 471 cases of contracted pelves or disproportion between the pelvic canal and the child presented and the method of delivery analyzed, 220 patients delivering spontaneously and 251 requiring operative interference.

2. The maternal mortality for the group is 0.42 per cent, both deaths being due to streptococcic septicemia.

3. The fetal mortality for the group is 10.8 per cent, of which one-third were due to intracranial hemorrhage.

4. The high fetal mortality in version and extraction, 28.5 per cent in the prophylactic operation and 66.6 per cent in the emergency operation.

5. Surgical induction of premature labor gives results which are not inferior to other methods of delivery, the fetal mortality being lower, but the maternal mortality, due to the risk of infection, greater.

6. In 104 cases of cesarean section there was no mother lost and the fetal mortality was only 2.8 per cent.

7. Craniotomy is the method of choice in those patients in whom the child has died in utero, or in which such a severe grade of infection is present that cesarean section is contraindicated.

THE RELATION OF THE WEIGHT OF THE PLACENTA, CORD
AND MEMBRANES TO THE WEIGHT OF THE INFANT
IN NORMAL FULL-TERM AND IN PRE-
MATURE DELIVERIES

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FOR over a hundred years clinicians have recognized that a relation exists between the weight of the placenta and the weight of the fetus. It has been tacitly assumed that the weight of the placenta was a certain fraction of the weight of the full-term infant. Williams (1923), Döderlein (1915), and DeLee (1929) give the ratio as 1:6.

Aside from its clinical significance, the relation between the weight of the placenta and that of the fetus may be of importance in a study of intrauterine growth. Some light may be thrown on such a study by the statistical analysis of a large number of instances.

The material for the present work was collected from the records of the Department of Obstetrics and Gynecology of the New Haven Hospital. Only those cases were used where the mother had no known malady. All cases of syphilis and placental bacteremia were excluded from the study. The procedure in every delivery was the same. As soon as the child was born the cord was ligated once and cut distal to the ligation, leaving a stump approximately 1 to 1½ cm. in length. The infant was weighed immediately following delivery. The placenta, cord and membranes, from which the blood clots had been removed by a pair of forceps, were weighed in the laboratory. In every instance the gross diagnosis was checked by a microscopic study of placental tissue.

The procedure of weighing the placenta was made as uniform as practicable, and the result is used in the present analysis without any attempt to estimate the weight of placental tissue exclusive of blood and other fluid which may remain. The result of such a weighing will be designated as the placental weight.

The work reported in this paper deals with 4,129 instances distributed in two main classes. There were 126 instances from deliveries where the fetuses weighed from 7 to 1,500 gm.; 4,003 instances were from normal deliveries, where the infants were born alive and weighed from 1,500 to 7,250 gm. In the latter class, the males and females were analyzed separately.

The results of the comparative weights for 1,963 females are given in Table I. In order to form the correlation table, a subdivision was made by cross classification, using an interval of 250 gm. for infant weight and 25 gm. for placental weight. It can be seen from the table that there is a positive correlation between the two. The correlation coefficient was found to be 0.484.

Chart I
Female Infants Weighing over 1500 grams

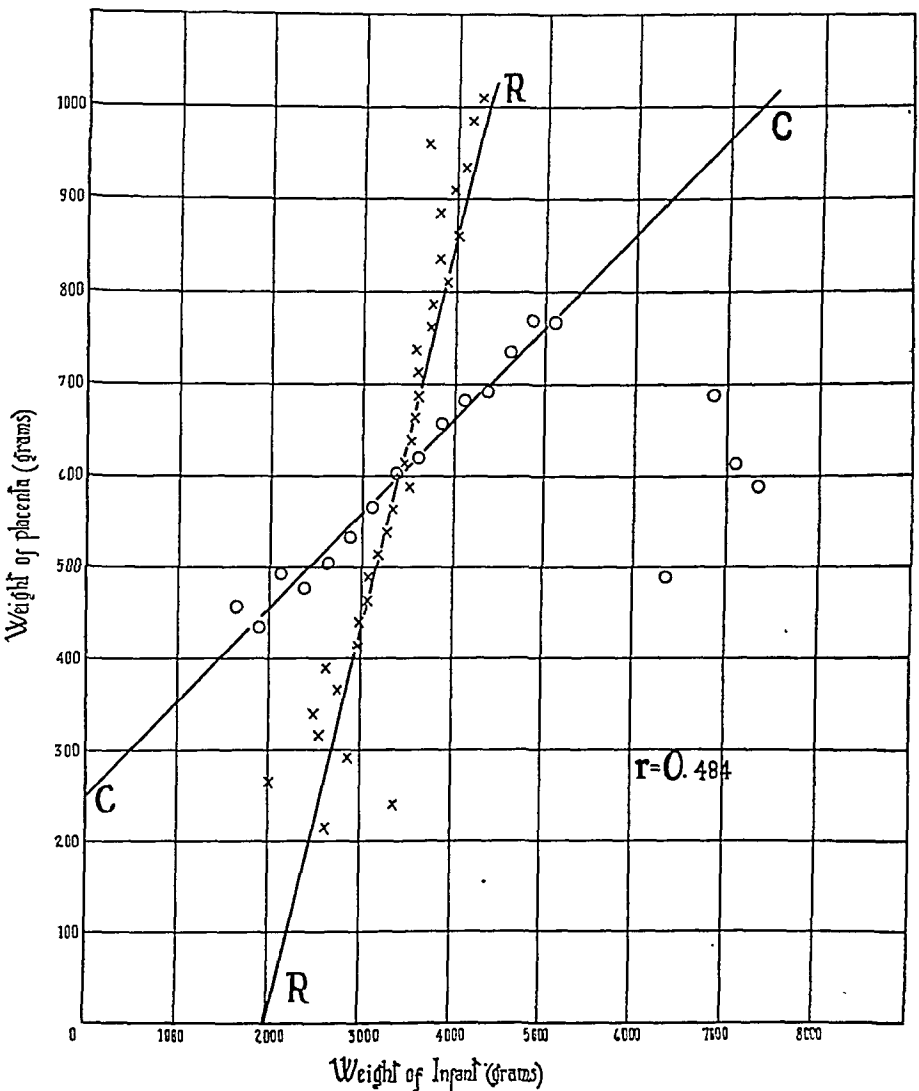


Chart 1 shows regression lines plotted from the data of Table I, and the means of the rows and columns. The means are very well fitted to the regression lines. It may be noted that the points which deviate most markedly from their corresponding lines represent only a small number of instances.

TABLE II. MALE INFANTS WEIGHING OVER 1500 GRAMS

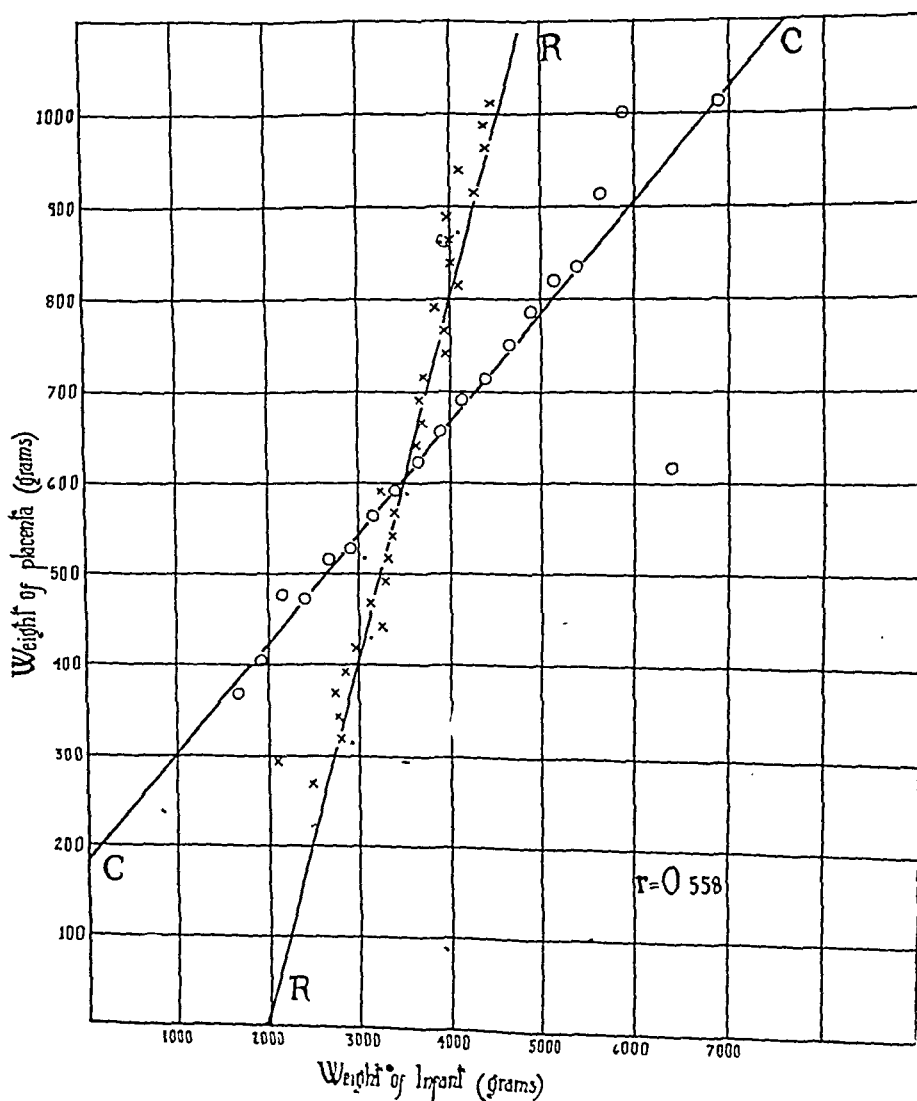
| | 1500-1749 | 1750-1999 | 2000-2249 | 2250-2499 | 2500-2749 | 2750-2999 | 3000-3249 | 3250-3499 | 3500-3749 | 3750-3999 | 4000-4249 | 4250-4499 | 4500-4749 | 4750-4999 | 5000-5249 | 5250-5499 | 5500-5749 | 5750-5999 | 6000-6249 | 6250-6499 | 6500-6749 | 6750-6999 |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 1000-1024 | | | | | | | | | | | | | | | | | | | | | | |
| 975-999 | | | | | | | | | | | | | | | | | | | | | | |
| 950-974 | | | | | | | | | | | | | | | | | | | | | | |
| 925-949 | | | | | | | | | | | | | | | | | | | | | | |
| 900-924 | | | | | | | | | | | | | | | | | | | | | | |
| 875-899 | | | | | | | | | | | | | | | | | | | | | | |
| 850-874 | | | | | | | | | | | | | | | | | | | | | | |
| 825-849 | | | | | | | | | | | | | | | | | | | | | | |
| 800-824 | | | | | | | | | | | | | | | | | | | | | | |
| 775-799 | | | | | | | | | | | | | | | | | | | | | | |
| 750-774 | | | | | | | | | | | | | | | | | | | | | | |
| 725-749 | | | | | | | | | | | | | | | | | | | | | | |
| 700-724 | | | | | | | | | | | | | | | | | | | | | | |
| 675-699 | | | | | | | | | | | | | | | | | | | | | | |
| 650-674 | | | | | | | | | | | | | | | | | | | | | | |
| 625-649 | | | | | | | | | | | | | | | | | | | | | | |
| 600-624 | | | | | | | | | | | | | | | | | | | | | | |
| 575-599 | | | | | | | | | | | | | | | | | | | | | | |
| 550-574 | | | | | | | | | | | | | | | | | | | | | | |
| 525-549 | | | | | | | | | | | | | | | | | | | | | | |
| 500-524 | | | | | | | | | | | | | | | | | | | | | | |
| 475-499 | | | | | | | | | | | | | | | | | | | | | | |
| 450-474 | | | | | | | | | | | | | | | | | | | | | | |
| 425-449 | | | | | | | | | | | | | | | | | | | | | | |
| 400-424 | | | | | | | | | | | | | | | | | | | | | | |
| 375-399 | | | | | | | | | | | | | | | | | | | | | | |
| 350-374 | | | | | | | | | | | | | | | | | | | | | | |
| 325-349 | | | | | | | | | | | | | | | | | | | | | | |
| 300-324 | | | | | | | | | | | | | | | | | | | | | | |
| 275-299 | | | | | | | | | | | | | | | | | | | | | | |
| 250-274 | | | | | | | | | | | | | | | | | | | | | | |
| | 9 | 11 | 23 | 36 | 95 | 157 | 306 | 333 | 456 | 268 | 173 | 80 | 59 | 19 | 5 | 5 | 1 | 2 | 1 | 1 | 1 | 2010 |

WEIGHT OF INFANT (GRAMS)

WEIGHT OF PLACENTA (GRAMS)

Now let W be the weight of the infant and Z the weight of the placenta (both in grams) in any given instance, and let S_w and S_z be respectively the standard deviations of observed points (W, Z) in a given experience from the corresponding fitted regression line. Furthermore, let D_w and D_z be respectively the weighted standard devia-

Chart II
Male Infants Weighing over 1500 grams



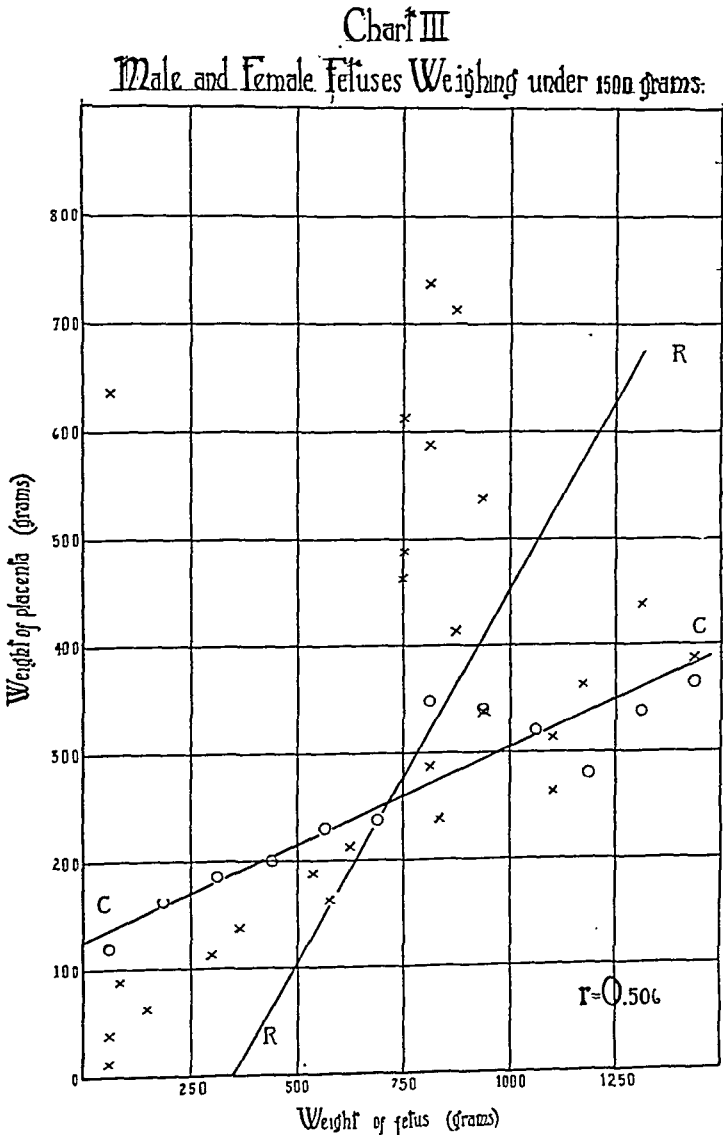
tion of means of arrays (rows or columns respectively) from the corresponding regression line. In the experience recorded in Table I, Chart 1, $S_w = 510$, $S_z = 108$; $D_w = 83$; $D_z = 19$.

The mean weight of the infant was found to be 3,399 gm. ($\sigma_w = 583$), and of the placenta, cord and membranes 597 gm. ($\sigma_z = 12.3$).

The ratio of the mean infant weight to the mean placental weight was 5.7.

Table II is a similar correlation table for the males. The class intervals are the same as in Table I. The correlation coefficient is 0.558.

Chart II shows the regression lines plotted for the data of Table II, and the means of the rows and columns. It is evident that the means



are well fitted to the regression lines. Here $S_w = 480$; $S_z = 104$; $D_w = 115$; $D_z = 12.3$. The average weight of the normal infant was 3,507 gm. ($\sigma_w = 578$), and that of the placenta was 607 gm. ($\sigma_z = 12.8$). The ratio of the mean newborn infant weight to the mean placental weight was 5.8.

Table III shows the weights of male and female fetuses under 1,500

gm. Here the placental weight class interval is 25 gm., and the fetal weight class interval 125 gm. The correlation coefficient is 0.506.

Chart III shows the regression lines and means. The means deviate much more from the regression lines than is the case in the two preceding instances, but it is reasonable to expect such a greater dispersion as the result of dealing with a smaller number of individuals. Here $S_w = 358$; $S_z = 126$. In general, it can be seen that the ratio of the mean weight of the fetus to the mean weight of the placenta is less than in the previous tables. The mean weight of the fetuses was 712 gm. ($\sigma_w = 414$), and that for the placentas 259 gm. ($\sigma_z = 14.6$). The ratio of the mean fetal weight to the mean placental weight was 2.7.

Torvald Brandt and Keren Sieck (1929) collected some 4,000 instances from Scandinavian births, and gave ratios between the weight of the infant and the weight of the placenta, cord and membranes. In their article they claim that the regressions are what has been called "logarithmic." The justification for this claim, however, is not easy to find. Westermarck (1926) presented over 19,000 instances giving

TABLE III. MALE AND FEMALE FETUSES WEIGHING UNDER 1500 GRAMS

| | 0-124 | 125-249 | 250-374 | 375-499 | 500-624 | 625-749 | 750-874 | 875-999 | 1000-1124 | 1125-1249 | 1250-1374 | 1375-1499 | |
|---------|-------|---------|---------|---------|---------|---------|---------|---------|-----------|-----------|-----------|-----------|-----|
| 725-749 | | | | | | | 1 | | | | | | 1 |
| 700-724 | | | | | | | 1 | 1 | | | | | 2 |
| 675-699 | | | | | | | | | | | | | |
| 650-674 | | | | | | | | | | | | | |
| 625-649 | 1 | | | | | | | | | | | | 1 |
| 600-624 | | | | | 1 | | | 1 | | | | | 2 |
| 575-599 | | | | | | | 1 | | | | | | 1 |
| 550-574 | | | | | | | | | | | | | |
| 525-549 | | | | | | | | 1 | | | | | 1 |
| 500-524 | | | | | | | | | | | | | |
| 475-499 | | | | | 1 | | | 1 | | | | | 2 |
| 450-474 | | 1 | | | | | | | | | 1 | | 2 |
| 425-449 | | | | | | | | | 1 | | 1 | 2 | 4 |
| 400-424 | | | | 1 | | | | | | | 1 | | 2 |
| 375-399 | | | | | | | | | | | | 1 | 1 |
| 350-374 | | | | | | | 1 | 1 | 3 | 2 | 1 | 3 | 11 |
| 325-349 | | | | | | | | 2 | | | | | 2 |
| 300-324 | | | | | | 1 | | 1 | 2 | 1 | 1 | 1 | 7 |
| 275-299 | | | 1 | | 1 | 1 | 1 | 2 | 1 | 1 | | | 8 |
| 250-274 | | | | | | 1 | | 2 | | 2 | 1 | 1 | 7 |
| 225-249 | | | 1 | 1 | 1 | | 1 | 2 | 1 | 1 | 1 | | 9 |
| 200-224 | | 1 | 1 | 6 | 2 | | 5 | | 1 | | 1 | | 17 |
| 175-199 | | | 1 | 1 | 3 | | 1 | | | | | | 6 |
| 150-174 | 1 | 2 | 1 | 2 | 3 | 2 | | 3 | | 1 | | | 15 |
| 125-149 | | 1 | 2 | 1 | 1 | | | | | | | | 5 |
| 100-124 | 3 | 1 | 1 | 2 | 2 | | | | | | | | 9 |
| 75-99 | 3 | 1 | | | | | | | | | | | 4 |
| 50-74 | 1 | 2 | | | | | | | | | | | 3 |
| 25-49 | 2 | | | | | | | | | | | | 2 |
| 0-24 | 2 | | | | | | | | | | | | 2 |
| | 13 | 9 | 8 | 14 | 15 | 5 | 12 | 17 | 9 | 8 | 8 | 8 | 126 |

the relation of the weight of the infant to that of the placenta, cord, and membranes. From an inspection of the graph, the fit of the logarithmic regression curves appears to be good, but no evidence of estimate of goodness of fit is given. The regression found in the present experience is at variance with this contention, but it is impossible to discuss this variance without the fundamental data upon which the calculations of these two authors are based.

In contrast to the above, Adair and Thelander (1925) have given all the fundamental data in the form of a correlation table. They have estimated the correlation coefficients (with separate analysis for males and females), but the subject of regression is untouched. This may be due to the fact that the total number of instances cited is only 370. The placenta was weighed without cord or membranes. Adair and Thelander came to the conclusion that a low ratio between the weight of the placenta and infant was found in premature and very small infants; and in agreement with Holland (1922) they reported a low ratio in abnormal cases, especially where toxemia of pregnancy was present in the mother, and a high ratio in postmature and large infants, which agrees with a statement by DeLee. Among the instances reported here of infants weighing between 1,500 and 2000 gm., there are instances in which there is a low ratio, as well as instances in which the ratio is high. Likewise, among the large infants there are found instances in which the ratio is low, as well as those in which the ratio is high.

CONCLUSIONS

The weight of the placenta is not a constant fraction of the weight of the child. The correlation coefficient shows that they influence each other to a large extent, but the fact that the correlation coefficient is not higher shows that other important influences must exist.

A positive correlation is observed in fetuses under 1,500 gm., but the fit of the means to the regression lines is not as good, probably because of the small number of individuals observed.

The mean placental weight and the mean infant weight for the male and female infants differ by an amount which is statistically significant.

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AN ANALYSIS OF 124 CASES OF LOW CERVICAL CESAREAN SECTIONS*

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IN THE years from 1922 to 1929 inclusive, 6,175 women were delivered in the Department of Obstetrics and Gynecology of the Evanston Hospital. During this time cesarean section was done 124 times. We wish to present a brief analysis of this series of cases. These operations, with the exception of 7, were done by the staff of this department of the hospital. Six of these 7 were done by a member of the teaching staff of Rush Medical College in the Department of Obstetrics and Gynecology who has courtesy privileges in the hospital. The seventh was done by a junior member of the surgical department.

During the first year or two of the time covered by this report the low cervical operation was used only in the cases in which a test of labor had occurred, the classical operation being used in the remainder. The difference in the smoothness of the convalescence in the cases in which the two types of operation were used soon impressed itself upon us and the newer operation came to be used with increasing frequency. At present the low cervical operation is routinely used. The gradual change in the frequency of the two operations will be seen in Table I.

TABLE I

| | LOW CERVICAL CESAREANS | CLASSICAL CESAREANS | TOTAL CESAREANS | TOTAL DELIVERIES | PER CENT CESAREAN INCIDENCE |
|--------|---------------------------|------------------------|--------------------|---------------------|-----------------------------------|
| 1922 | 2 | 9 | 11 | 608 | 1.8 |
| 1923 | 1 | 3 | 9 | 622 | 1.4 |
| 1924 | 0 | 10 | 10 | 741 | 1.3 |
| 1925 | 6 | 12 | 18 | 725 | 2.4 |
| 1926 | 20 | 9 | 29 | 847 | 3.4 |
| 1927 | 31 | 5 | 36 | 829 | 4.3 |
| 1928 | 31 | 8 | 34 | 904 | 3.7 |
| 1929 | 33 | 1 | 34 | 899 | 3.7 |
| TOTALS | 124 | 57 | 181 | 6175 | |

Total Cesarean Incidence 2.9%

Total Low Cervical Incidence 2.0%

Total Classical Incidence 0.9%

The technic used is essentially that described by DeLee and Beck, which has been described repeatedly, and we have ourselves referred to it in a previous communication. Imbrication is used at present

*Read before the Chicago Gynecological Society, February 21, 1930.

only in cases which have been long in labor or in those in which we fear the possible presence of infection. We have not used the uterine pack. We invariably have the gauze packing and the instruments for its application ready in order that it may be used if hemorrhage is difficult to control but in this series it was not used at all.

In cases in which a test of labor has preceded operation, we make use of the vaginal application of mercurochrome as suggested by Mayes.

No member of our service has employed the transverse uterine incision of Kerr and Hendry. The senior author saw this procedure carried out by Dr. Hendry in Monro Kerr's Clinic in Glasgow with excellent results, and we are aware of the favor with which it is regarded by Barton Cooke Hirst and John Cooke Hirst and of the good results following its use by the obstetric staff of the Michael Reese Hospital of Chicago. We have, however, preferred to follow the technique to which we have become accustomed.

Our routine anesthetic has been ethylene although in the past two years all cases operated upon for preeclamptic toxemia have been done under local anesthesia. In toxic cases local anesthesia is preferable, Stander's work having clearly shown that inhalation anesthetics should be avoided.

Fourteen of our patients were operated upon because of a previous abdominal delivery either in our own hands or elsewhere. While the necessity of always doing an abdominal delivery where a previous section has been done has been questioned by some writers, a large volume of opinion favors it. In our service we feel that it is safer to do it. Certainly if the woman has never delivered a baby through the birth canal it seems wiser not to subject the uterine scar to strain. When the danger of abdominal delivery can be reduced to the level which is shown in this report, and similar reports from other services, it does not seem proper to subject the woman to the risk of strain upon the scar. The risk of rupture of the uterine scar in labor occurring after the classical operation is probably about 4 per cent. The risk of rupture after the low cervical operation is probably much less but an accurate evaluation of the risk must probably await reports upon a larger number of cases in which rupture has occurred than are at present available. We have been gratified in observing the small amount of adhesions present in second operations after a previous low cervical section. In those cases in which we have done a second low cervical section we have found scarcely more difficulty in separating the bladder than in primary operation, indeed, in some cases no difference could be noted. The average amount of postoperative adhesions would appear to be less than is found after classical section.

We had 43 cases in which a test of labor preceded operation. The average length of labor preceding operation was twenty-four hours.

While the conception of what constitutes a test of labor varies in different institutions, probably the best definition which has been given is that a test of labor may be considered to have been had, when, after dilatation is complete and the membranes ruptured, pains of good force at intervals of not more than five minutes have occurred for not less than one hour. The majority of our cases have met this definition. In any event labor should go on until an obstetrician of some experience honestly feels that the safety of the mother and child will be greater if abdominal section is done than if some form of vaginal delivery is elected. Twenty-four of our test cases had the membranes ruptured, the average length of time being 11.3 hours.

TABLE II

| | |
|--------------------------------------|------------|
| Total number cases having test labor | 43 |
| Average hours in labor | 24.0 hours |
| Number with ruptured membranes | 24 |
| Average number hours ruptured | 11.3 hours |
| Number having bag inductions | 3 |

In three cases of severe and increasing toxemia bag induction has been attempted and had failed. A day or two was allowed to elapse after the removal of the bag before the performance of the low cervical section. In one case rather more than the usual amount of tympanites occurred but in all three the result was satisfactory.

In this series of cases only one death occurred, making a mortality rate of 0.8 per cent. The mortality percentage for the entire series is shown in Table III. The case which was lost was that of a woman who had had a previous classical cesarean section in another hospital. She had a history of attacks of syncope and had been under the observation of a well-known internist until shortly before coming to the hospital for delivery. An unusual number of troublesome adhesions were found. Hemorrhage was not excessive. Death occurred about two hours after operation with all the clinical evidence of shock. Autopsy was not permitted.

TABLE III

| | | | |
|---|---|------|----------|
| Total maternal deaths, all cesareans, | 4 | 2.2 | per cent |
| Total maternal deaths, classicals (57), | 3 | 5.2 | per cent |
| Total maternal deaths, low cervicals (124), | 1 | 0.80 | per cent |
| Total fetal mortality, low cervicals, | 4 | 3.2 | per cent |

One woman developed a pneumonia during convalescence and was seriously ill but recovered. Another elderly primipara with a distinctly flat pelvis, who was operated upon after a test of labor conforming in every particular to the statement noted above, had, a few hours after delivery, serious respiratory difficulty which was called an acute asthmatic attack by the medical consultant. She had a

stormy convalescence, the trouble being entirely thoracic, at no time showing any evidence of any intraabdominal disturbance. Recovery followed. In the great majority of our cases the recovery was smooth and uneventful. Tympanites and vomiting was very much less than had been the rule when the classical operation was routinely done. The reasons for the greatly simplified convalescence in those cases in which the incision is located in the lower, noncontractile segment of the uterus have been discussed so often that we will not again go into them.

We feel that our results for the past eight years show an undoubted advantage in favor of the newer technic. It is true that our experience with the classical operation during the first two years of this time was more unfavorable than during any similar period of time before. Allowance is made for this. Of the three women who died following classical section, one was lost on the thirteenth day after operation from pulmonary embolism after an uneventful convalescence. Another died following section done for central placenta previa, the woman also having a flat pelvis. A third, a primipara of forty-three with several fibroids of varying size in the uterus, and who had a history of myocarditis, died with what appeared to be an acute cardiac dilatation. Postmortem examination of the abdomen only was secured. This showed an entire absence of peritonitis, the uterine wound was in excellent condition and no hemorrhage had occurred. Another case not included in this series was that of a woman eight months pregnant who had had a previous pelvic laparotomy. She developed a mechanical intestinal obstruction, the cause being a peritoneal band. Obstruction was complete. Operation was primarily intended to relieve the obstruction, the uterus being emptied to facilitate this. She was not in good condition when operated upon, the obstruction was difficult to deal with and she died twenty-four hours later. This death should not be charged against the cesarean section as the real cause of death was intestinal obstruction. This case is not included in our mortality list.

The incidence of morbidity will be shown in Table IV.

TABLE IV. MORBIDITY IN LOW CERVICAL CESAREANS

| | TOTAL OPERATIONS | TOTAL PATIENTS MORBID | | MORBID PATIENTS AVERAGE DAYS MORBID | RANGE DAYS MORBID |
|--------|---------------------|--------------------------|-----|---|-------------------------|
| | | NO. | % | | |
| 1922 | 2 | 0 | 0 | 0.0 | 0 |
| 1923-4 | 1 | 1 | 100 | 1.0 | 1 |
| 1925 | 6 | 2 | 33 | 1.0 | 1 |
| 1926 | 20 | 10 | 50 | 3.5 | 1 to 7 |
| 1927 | 31 | 17 | 55 | 3.3 | 1 to 8 |
| 1928 | 31 | 11 | 35 | 3.5 | 1 to 9 |
| 1929 | 33 | 18 | 54 | 2.5 | 1 to 11 |

For the purpose of this report we have considered as morbid any case in which a temperature of 100° F. occurred twice in any twenty-

four hours, the temperature being taken four times daily. Most of the cases showing temperature did so for a day or two only. In two cases wound infection occurred, one of these being the woman referred to above who developed a pneumonia.

TABLE V

| PELVIC DEFORMITIES | 1922-'25 | 1926 | 1927 | 1928 | 1929 | TOTAL |
|---|----------|------|------|------|------|-------|
| Contracted pelvis, test labor | 2 | 4 | 6 | 4 | 4 | 20 |
| Flat pelvis, test labor | 0 | 1 | 3 | 0 | 0 | 4 |
| Disproportion, test labor | 4 | 5 | 3 | 2 | 5 | 19 |
| Contracted pelvis, elective | 1 | 2 | 7 | 2 | 2 | 14 |
| Flat pelvis, elective | 0 | 1 | 3 | 3 | 2 | 9 |
| | 7 | 13 | 22 | 11 | 13 | 66 |
| PREVIOUS CESAREAN SECTIONS | | | | | | |
| For contracted pelvis | 0 | 0 | 0 | 3 | 1 | 4 |
| Disproportion, test labor | 0 | 0 | 0 | 2 | 0 | 2 |
| Placenta previa | 0 | 0 | 1 | 0 | 0 | 1 |
| For previous stillbirth (difficult labor) | 0 | 1 | 0 | 1 | 2 | 4 |
| For unknown reasons | 0 | 1 | 0 | 2 | 0 | 3 |
| | 0 | 2 | 1 | 8 | 3 | 14 |
| OTHER INDICATIONS | | | | | | |
| Preeclamptic toxemia | 1 | 2 | 1 | 3 | 10 | 17 |
| Previous cervical plastic operation | 0 | 1 | 2 | 2 | 0 | 5 |
| Obstructing tumor | 0 | 0 | 3 | 2 | 0 | 5 |
| Repair of 3° laceration | 1 | 0 | 0 | 2 | 0 | 3 |
| Cardiac decompensation and sterilization indicated | 0 | 1 | 0 | 0 | 3 | 4 |
| Cervical dystocia | 0 | 0 | 1 | 1 | 0 | 2 |
| Elderly primipara, breech | 0 | 0 | 0 | 0 | 1 | 1 |
| Lost first baby in difficult operative delivery | 0 | 1 | 0 | 0 | 0 | 1 |
| Ablatio placentae | 0 | 0 | 0 | 0 | 1 | 1 |
| Elderly primipara, psychosis (unengaged large head) | 0 | 0 | 0 | 0 | 1 | 1 |
| Rectovaginal fistula | 0 | 0 | 0 | 0 | 1 | 1 |
| Hyperthyroidism | 0 | 0 | 0 | 1 | 0 | 1 |
| Pulmonary tuberculosis and tuberculous pleuritis | 0 | 0 | 1 | 0 | 0 | 1 |
| Severe cystitis after two previous labors, seventeen years since last labor | 0 | 0 | 0 | 1 | 0 | 1 |
| | 2 | 5 | 8 | 12 | 17 | 44 |

There is no doubt that cesarean section is done too frequently. There is also no doubt that the mortality the country over is unjustifiably high. Probably the greatest single factor in the production of this high mortality is the use of the operation in cases in which an experienced obstetrician would choose some other form of delivery. The unfortunate results of operations done by the classical method, after lengthy labors and particularly after attempts at delivery had been made from below, are strikingly shown in the figures published by Eardley Holland some years ago. The series here reported were done in a well-equipped and well-organized maternity by a small group of operators, all of whom had had the benefit of obstetric training, and all of whom were able to do the operation properly. This series is presented primarily for the purpose of showing that under such circumstances cesarean section may be done with a high degree

of safety. The risk here shown does not exceed the risk of alternative procedures which may be considered, particularly in cases in which a test of labor has occurred. The injury to the woman is much less than that which may be expected as a result of a difficult forceps or version and the risk to the child is lessened to an even greater degree.

The incidence of operation during the time covered by this report is 1 in 34.5. This is less than the frequency reported from a number of the best obstetric services in the country. The obstetric service of one of the best hospitals in the East recently reported an incidence of 1 in 21.

The increasing safety of this operation under proper circumstances should not lead to its too frequent use. There is a real tendency, even in well-staffed institutions, for too great a proportion of obstetric problems to be solved by abdominal delivery. This should be guarded against, particularly in young women, as the advisability of abdominal delivery in later pregnancies tends to a limitation of reproductivity.

Our experience causes us to believe that the low cervical cesarean section is definitely preferable to the older operation. We have found that both the mortality and the morbidity following the low cervical procedure to be materially lower. The fact that it may be used after a fair test of labor is an additional and weighty argument in its favor. The majority of experienced obstetricians regard the classical operation as an elective procedure, to be done before labor, or at latest, in the early hours of labor. With this view we agree.

The greatest single advantage of the low cervical technic is that it permits the safe use of a test of labor. As 75 to 80 per cent of women with relatively contracted pelvis will deliver their babies without abdominal section, it is of great value to possess a procedure which will permit a test and still allow a safe abdominal delivery for the minority who fail to bring the head into the pelvis. In our own experience the number of women with relative contraction who have been delivered vaginally far outnumber those who were subjected to cesarean section after a test of labor.

It is evident, from our own experience and from the experience of other well-organized obstetric services that the mortality of cesarean section in this country generally is too high. It is possible in good surroundings, with trained operators, to obtain a mortality rate for cesarean section which will compare far more favorably with the mortality rates for standard pelvic operations in similar institutions than was the case with the classical operation. The use of cesarean section as a procedure of last resort, after attempts at other forms of delivery, contributes much to the unjustifiably high death rate.

A NEW RECTAL ETHER ANALGESIA APPARATUS*

By C. O. McCORMICK, M.D., INDIANAPOLIS, IND.

(Associate, Obstetrical Department, Indiana University School of Medicine)

THIS apparatus was designed primarily to simplify the rectal instillation of the ether-oil solution prescribed by the Gwathmey technic in the conduct of obstetric analgesia. For the past four months it has been employed in the William H. Coleman Hospital for Women, and is thoroughly endorsed by the nursing staff of that institution.

The instrument is cast of the best grade of aluminum. It has a circular base 7 inches in diameter, stands 6½ inches high, and weighs 1 pound and 10 ounces. It is very durably built and except for the rubber parts, will withstand indefinite

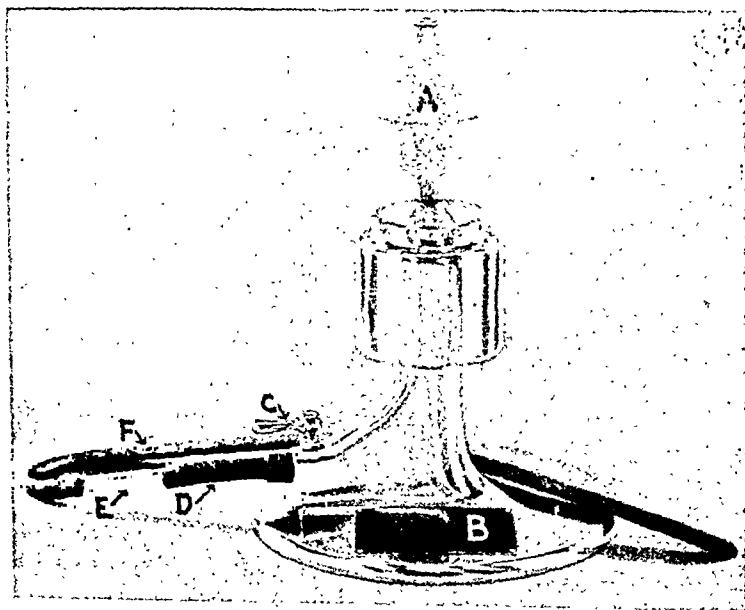


Fig. 1.

usage. Fig. 1 shows the instrument assembled, and Fig. 2 represents it in cross-section. The essential features are lettered, and may be enumerated as follows:

- A, DeVilbiss bulb.
- B, Metal plate, bearing instructions.
- C, Stopcock.
- D, ⅜" red rubber connecting tubing (machine made).
- E, 3" x ⅜" glass connecting tip.
- F, 22 Fr. red rubber catheter.
- G, 1¼" screw-cap.
- H, 5-ounce chamber.
- I, Fixed stratifying device.
- J, 1-ounce chamber.

*Manufactured and sold by the William H. Armstrong Co., 233 N. Pennsylvania St., Indianapolis, Indiana.

The directions for the use of the apparatus are concretely stated on the metal plate (B), and read:

(Patient on left side, emptied lower bowel, thighs flexed, buttocks at edge of bed.)

1. Close stopcock, pour in one ounce of mineral or olive oil.
2. Pour in ether-oil mixture, screw on cap.
3. Open cock until oil runs through catheter (22 Fr. red rubber).
4. Spread lubricant freely over and about anus.
5. Insert well lubricated catheter 6 to 8 inches into rectum.
6. Remove right glove, open cock, hold catheter in place with left hand.
7. With right hand compress bulb, between pains only, not over 20 to 30 times per minute.
8. Just as the bubble passes through the sight-feed, stop compression and close cock.
9. Remove catheter, make pressure over anus with folded towel for ten to fifteen minutes.

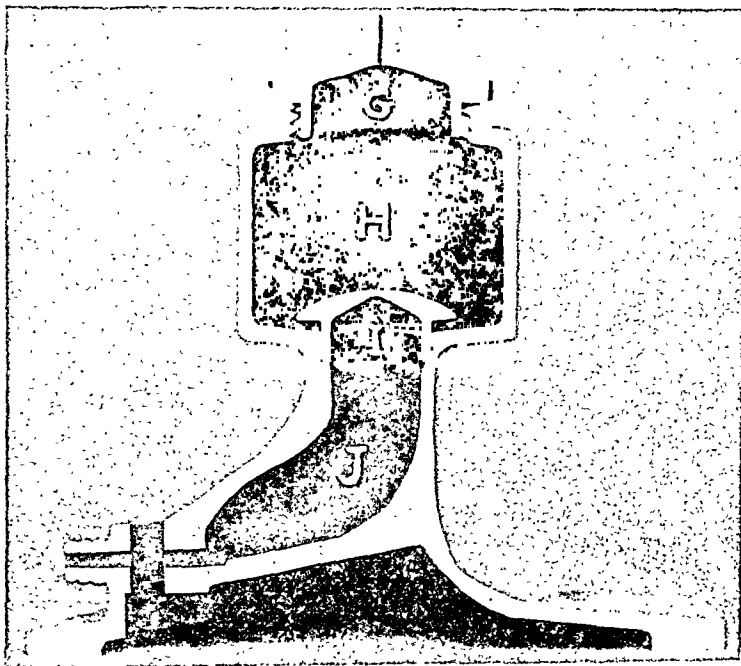


Fig. 2.

SOME HELPS

1. Do not warm either the oil or ether-oil mixture. The absorbability is sufficiently rapid without warming and there is no loss of ether by evaporation.

2. Although vaseline is the popular lubricant, either a tragacanth or a seaweed jelly is preferable, as it does not deteriorate the rubber, and greatly facilitates cleansing the patient and laundering the linen.

3. Do not add an ounce of oil after the instillation of the ether-oil solution. Although included in the Gwathmey technic, it has been found unnecessary.¹

4. To cleanse, remove catheter and cap, and run "scalding" water through the instrument by placing it beneath a running faucet. May add 1 drachm tincture of green soap. The catheter is the only part requiring sterilization.

¹Smith, D. L.: J. A. M. A. 90: 1031, 1928.

PRECAUTIONS

1. Do not compress the bulb too rapidly, not over 20 to 30 times per minute. Rapid instillation may invoke spasm of the lower bowel, and render retention difficult.

2. A rectal tube allows the solution to flow too freely, and should not be substituted for the 22 Fr. catheter.

3. Be sure to cease compression the instant the bubble passes the sight-feed, thus avoiding forcing air into the bowel, and preventing immediate or subsequent expulsion of the solution.

4. Administer only between contractions and not during, as retention is thus frequently made impossible.

5. Be certain the catheter is not curled in the rectum, and see that it passes the presenting part if the latter is low, using a gloved finger if necessary.

Compared with the various known methods of instillations, this apparatus affords the following advantages:

1. It eliminates all necessity for assistants, therefore, the general practitioner or student nurse can perform the instillation alone.

2. It is decidedly neater, as there is no spilling or regurgitation.

3. The actual instillation can be readily performed within thirty to forty seconds, that is, within the interval of any two consecutive pains. (The gravity method usually requires 2 to 4 intervals.)

4. Because of the forced instillation and no "pain" pressure interruption, the solution is instilled higher and retention is better.

5. More economical. In addition to dispensing with the "follow-up" ounce of oil (as also recommended by the Lilly method), it prevents the loss of oil and the ether solution incurred by slipping and difficult tube connections. Also, if an institution wishes to furnish its own oil and ether mixture, it can do so at a saving of 60 to 75 per cent.

6. By eliminating assistants, and clumsy administration, it perceptibly adds refinement to the technic.

504 MEDICAL ARTS BLDG.

Terruhn: Leucoplakia and Kraurosis Vulvae. Arch. f. Gynäk. 138: 318, 1929.

According to the author, leucoplakia is not a disease entity in itself. The condition should be really termed a leucodermia rather than a leucoplakia and considered as a manifestation of the first stage of kraurosis vulvae. The regressive and atrophic changes of the second and third stages of kraurosis vulvae make a "stationary" or permanent leucoplakia an impossibility. It is impossible to have a kraurosis vulvae without a leucodermia, i.e., a loss of pigment but a vitiligo vulvae is possible without the presence of a kraurosis. Such a vitiligo is frequently confused with kraurosis vulvae but there is absolutely no pathologic connection between the two conditions; they must therefore be sharply differentiated. A vitiliginous leucodermia of the vulva is probably due to an irritation of the internal pudendal nerve.

RALPH A. REIS.

Case Reports

DIAGNOSTIC LIPIODOL INJECTION INTO MILK-DUCTS FOLLOWED BY ABSCESS FORMATION*

BY EMIL RIES, M.D., CHICAGO, ILL.

UNLOOKED for and undesirable sequelae of the injection of lipiodol into milk-ducts for diagnostic purposes caused the physician who had made the injections to refer his patient to the Post-Graduate Hospital for treatment. The physician also gave the details of the history of the case and permitted the use of the films made for him after the injection.

The patient was thirty-six years old. She had her second child in May, 1928, which was breast-fed for twelve months. In July, 1929, six weeks after weaning her baby, she noticed blood coming out of the right nipple. Shortly afterward

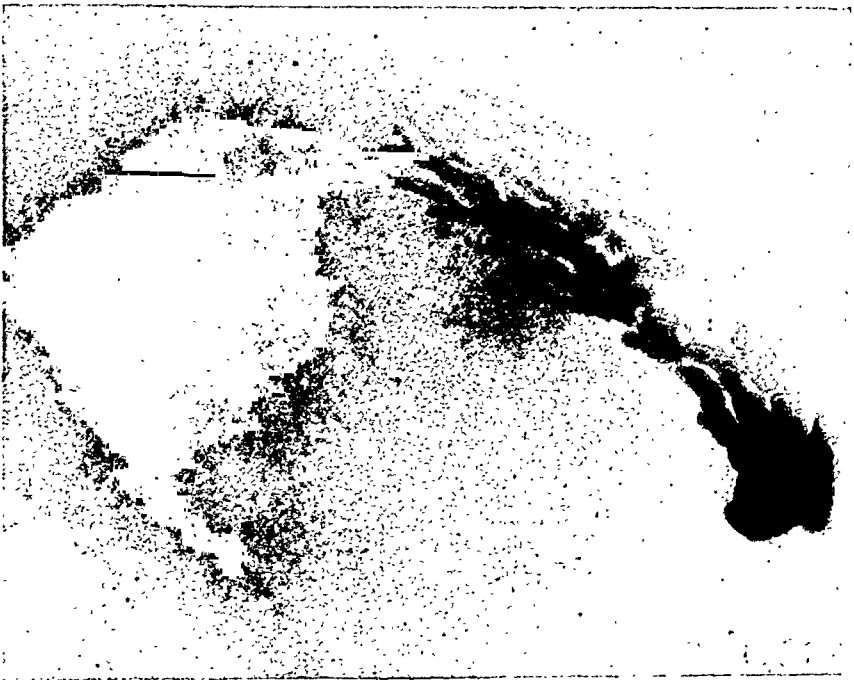


Fig. 1.

she consulted a physician who found a little nodule in the upper outer quadrant of her right breast and expressed some blood from one duct. On July 30, 1929, in order to determine the nature of the tumor and its extent, the doctor injected lipiodol, through a fine ureteral catheter, into the milk-duct from which he had squeezed out the blood.

As the other breast showed some brown discharge from one milk-duct, but no tumor, he also injected that canal with lipiodol.

X-ray examination showed beautifully the extent of the tumor-bearing cavity in the breast filled with lipiodol. It also showed the entire milk-duct and its branches with the contrast fluid. (Fig. 1.)

*Read before the Chicago Gynecological Society, February 21, 1930.

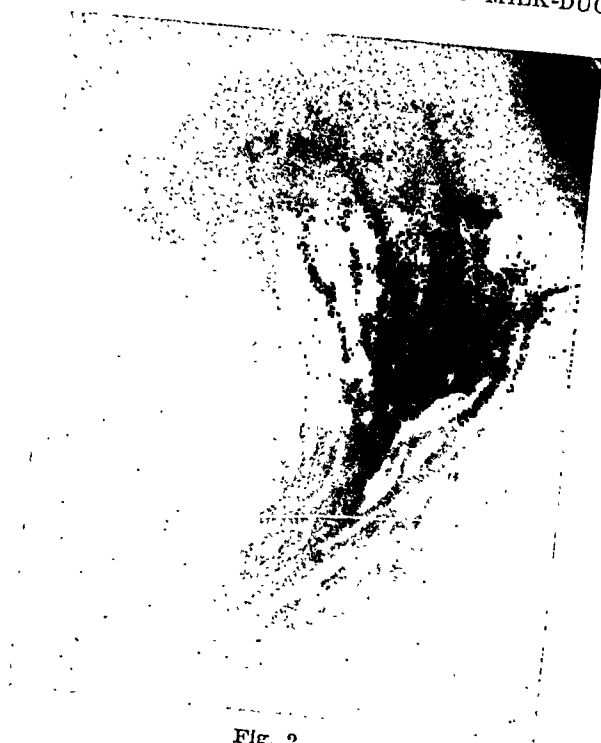


Fig. 2.



Fig. 3.

Fig. 2 shows the left breast after the injection, giving a very perfect picture of the branching duct.

The tumor, a papilloma, was removed by her physician and the wound healed perfectly. Six months afterward there was a very good scar. However, seven weeks after the injection, the woman began to have pain in the nontumorous breast. A painful swelling developed which broke down and the process of abscess formation went on until admission. The abscesses had to be opened and there was a constant discharge of pus for six months. When she came under our observation, the sector of breast involved showed four distinct abscess openings and the entire sector was infiltrated and painful. There was copious discharge of brownish pus requiring frequent dressings.

We performed a conservative operation, resecting only the part of the breast affected by the abscesses. Immediately after the operation we took an x-ray picture of the tissue removed. Fig. 3 shows that the milk-ducts still contained lipiodol.

On microscopic sections nothing was found except inflammatory changes. No carcinoma or tuberculosis was found. The tissue showed an extensive inflammatory infiltration with quite a number of giant cells. It showed no caseation and no proliferation of milk-ducts.

Of course we are unable to say whether the breaking down is due to the injection of lipiodol or not. There may have been an infection of some kind subsequently which caused the breaking down. We have found no way of demonstrating lipiodol in the inflammatory areas on sections.

While the demonstration of the size and shape of the milk-ducts by the lipiodol was perfect, the sequelae may suggest considerable caution in the application of this procedure.

Salmond, Margaret: The Use of Glycerin in Cesarean Section. *Lancet* 217: 659, 1929.

After the removal of the placenta the uterus retracts quickly on applying glycerin to the uterine cavity. This drug is also recommended because of its value in the presence of infection, particularly in establishing uterine drainage. The report is given with the intention of stimulating control work by others.

H. C. HESSELTINE.

Neuman, H. O.: Histologic Studies Concerning the Sympathicotropic Cells of the Hilus of the Ovary. *Arch. f. Gynäk.* 136: 550, 1929.

Neuman describes the so-called sympathicotropic cells found in the hilus of the ovary which were first described by Berger. These cells are specific sex cells and have nothing to do with the heterosexual development. They are found in the ovaries of newborn girls, disappear during childhood and again develop during puberty. They undergo a definite hypertrophy and hyperplasia during pregnancy and are more numerous in multiparae than in nulliparae or primiparae. As women approach the menopause these cells gradually decrease in number. The author was unable to study the activities of these cells in relation to the menstrual cycle. He reaches no conclusions as to whether these cells are paraganglion cells or chromaffin cells nor does he as yet arrive at any conclusion as to their specific function.

RALPH A. REIS.

THE ASSOCIATION OF POLYCYTHEMIA WITH OCCLUSION OF THE INFERIOR VENA CAVA

REPORT OF A CASE*

BY HENRY J. TUMEN, A.B., M.D., PHILADELPHIA, PA.

(Assistant in Medicine, Graduate School of Medicine, University of Pennsylvania)

THE opinion of F. Parkes-Weber¹ that polycythemia vera has its cause in an overactivity of the erythroblastic tissue is very widely accepted. There are cases, however, in which a high red cell count is found and in which this high count is evidently secondary to a known excitant of the bone marrow. Such cases are distinguished from true polycythemia by calling them secondary. Very frequently their only difference from an idiopathic case is that their cause is known.

Among the better studied causes of polycythemic reaction are those in which an anoxemia is the excitant. These are, for instance, exposure to the low oxygen tension of high altitudes, congestive heart failure, and, in congenital heart disease, the type which affects the pulmonary circulation.

As a cause of polycythemia an obstructive lesion affecting a large portion of the circulatory bed has been frequently mentioned and a few such cases are reported. Of course, pulmonary fibrosis and congenital heart disease are forms of circulatory obstruction but in these cases the resulting polycythemia can be definitely ascribed to the anoxemia. A case of circulatory obstruction of a different type was reported by Reckzeh.² This author cites a case of malignancy of the thymus and lungs with obstruction of the superior vena cava. In this case a polycythemia was early found in the upper half of the body only; later a polycythemia developed in the lower part of the body as well. Reckzeh considered the congestion resulting from obstruction a cause of the increased red cell count. He experimented on dogs and in two animals succeeded in causing a partial occlusion of the great veins close to the heart. In these two dogs a polycythemia developed. However, from Reckzeh's report it seems that the pulmonary veins were also ligated so that pulmonary stasis may have been a factor. Lommel³ considered that chronic stasis in a large circulatory area can call forth a polycythemic reaction, especially if this occurs in the portal circulation. In 1912 Abrahamson⁴ reported a case of obstruction of the superior vena cava by sarcoma with a polycythemia of the upper half of the body. Other cases of vascular obstruction associated with polycythemia are those of Van der Weyde and Van Ijzeren⁵ (thrombosis of the portal vein); Chauffard and Troissier⁶ (splenic and portal thrombo-

*From the Service of Dr. Wm. R. Nicholson, Graduate Hospital, Philadelphia, Pa.
Read at a meeting of the Philadelphia Obstetrical Society, March 6, 1930.

phlebitis); Monro and Teacher⁷ (old portal thrombosis); Münzer⁸ (probably an obstruction of the superior vena cava by pressure from a substernal goiter or collection of fat) and Hume and Shaw⁹ (thrombosis of the splenic artery and vein). Parkes-Weber¹⁰ also reported a case of erythromelalgia and polycythemia which later developed a very large abdominal tumor, probably ovarian.

Both Parkes-Weber¹ and Gaisböck¹¹ believe that a condition of blood stasis affecting a large part of the body can cause a polycythemia. Gaisböck, however, is of the opinion that the thrombosis found at autopsy in many cases is a result of the polycythemia rather than a cause of the disease.

In view of the scarcity of cases in which circulatory obstruction other than cardiopulmonary is associated with polycythemia the following case is reported:

M. W., a negress, thirty-six years of age, was admitted to the Graduate Hospital October 29, 1929 on the service of Dr. Wm. R. Nicholson. She complained chiefly of vaginal bleeding. She had had her menses in August and in September, and they had seemed normal except for a slight decrease. A normal period occurred early in October and she began to bleed again on October 26, three days before admission.

Abdominal swelling was noticed about five months before admission. This swelling had gradually increased. Dilatation of the veins of the legs was noticed with the onset of the abdominal swelling. Beginning three weeks before admission almost daily attacks of severe lower abdominal pain had occurred. Since she had had nausea and vomiting and some swelling of the breasts about nine months before admission and had recently felt what she thought were fetal movements, the patient was sure that she was pregnant. There were no other complaints save increased urination.

When the high red cell count was noted, the patient was questioned about the presence of headaches, dizziness, and tinnitus but had noticed none of these. She also denied the use of any drugs that occasionally cause polycythemia.

On physical examination there was no cyanosis but the mucous membrane of the mouth and the nail beds was engorged. The sclerae were injected; the teeth were poor; the tonsils were diseased and there was no lymphatic enlargement. There was a slight fibrosis at the right apex. The heart was entirely normal; the blood pressure was 132/106. The abdomen contained a centrally placed tumor apparently arising from the pelvis and reaching almost to the xyphoid. It felt cystic. No fetal parts could be felt or heart sounds heard. A fluid wave was present. Neither the liver nor the spleen was enlarged. There were slight pretibial edema and swelling of the veins of the legs. The veins of the upper thigh, especially the superficial circumflex iliacs were dilated. The vaginal examination showed displacement of the cervix upward and a large tumor mass, probably arising from the uterus.

A diagnosis of large uterine fibroid was made.

The urine was negative on repeated examinations. The red blood cells varied from 8,010,000 to 8,600,000 per c.mm. No abnormal red cells were found and the reticulocytes were 0.1 per cent. The hemoglobin was 123 per cent to 140 per cent; the white cells 3,650 to 6,350 with normal differential counts. The platelets were 208,000. Blood volume studies were not done. The coagulation time was four minutes and bleeding time one and three-quarters minutes. The Wassermann and Kahn tests were positive. The blood chemistry was normal.

An eyeground examination showed marked dilatation of the retinal veins. X-ray

studies showed a large tumor mass in the lower abdomen with no evidence of pregnancy. The lungs showed signs of an old bronchitis.

At operation the uterus and general tumor mass could not be differentiated. Adhesions were found involving the parietal peritoneum universally, so widespread and dense that even the round ligaments could not be appreciated. The ovaries were also buried by dense adhesions. The upper pole of the tumor was adherent to the diaphragm by a band fully three fingers broad. The adhesions were very friable and bled most profusely. Any attempt at removal was out of the question and therefore to control oozing a pack was inserted and the abdomen closed. The patient, however, lost so much blood that she was practically exsanguinated and died about three hours after leaving the operating room.

Permission for autopsy was not given but despite this the operative wound was reopened. An immense degenerated fibroid was found. It was adherent to the abdominal walls anteriorly, laterally, and posteriorly. Pressure was exerted on the inferior vena cava so as to partially occlude it. The vein was not opened.

In 1911 Pleasants¹⁷ published a very comprehensive monograph on obstruction of the inferior vena cava. This is an analysis of 314 cases in all, including 18 cases from the Johns Hopkins records. Unfortunately there is no record in any of these cases of a blood count after the onset of the obstruction. Pleasants emphasizes the fact that obstruction of the inferior vena cava can occur, even suddenly, as in surgical ligation, entirely without symptoms; superficial collateral circulation and edema may be entirely absent.

Since the appearance of Pleasants' article, many case reports of inferior vena cava thrombosis have appeared and surgical ligation of this vein is being done for various indications. Most of the reports of ligations comment on the good health of the patients following operation with the presence of at most transient signs of circulatory obstruction. The reports on inferior vena cava thrombosis, notably that of Simpson¹² who discussed the 78 cases of tumor thrombosis reported to the date of his publication, comment on the infrequency of antemortem diagnosis due to an absence of signs. These points are mentioned to show that a complete obstruction of the vena cava is by no means incompatible with health and compensated circulation. Weiss¹⁴ reported a case of thrombosis of the inferior vena cava diagnosed during life, and in a personal communication informs us that after the onset of the thrombosis his patient developed a red cell count of 5,750,000. It is highly probable that in most of the cases of inferior vena cava thrombosis no polycythemia developed. Many of the cases of surgical ligation, however, were not studied hematologically. Such studies might have produced a few more individuals who reacted with a polycythemia to such a circulatory disturbance.

In the case here reported one can only speculate as to the relationship between the vena cava occlusion and the polycythemia. They might have been coincidental. One is tempted, however, to consider the circulatory obstruction as a cause of the blood picture. F. Parkes-Weber, Gaisböck, Harrop,¹⁵ and in fact most of the writers who dis-

cuss the cause of polycythemia seriously consider blood stasis as a possible cause of the disease. Parkes-Weber, in fact, says that the principal rival to his theory that polycythemia is entirely due to hyperplasia of the bone marrow is the theory that stasis may cause, at least in some individuals, a polycythemic reaction. Just how this reaction is caused, however, is not clear. It might be mechanical congestion, or a distortion of the normal blood distribution. Lommel³ and Münzer⁵ are subscribers to the theory that in marked circulatory obstruction the hemoglobin undergoes some change which interferes with its oxygen-carrying capacity. They believe that the resulting anoxemia causes an overstimulation of the bone marrow. This idea has received some confirmation by the work of Lundsgaard¹⁶ who found a lowered coefficient of oxygen utilization in polycythemia and that of Harrop¹⁷ and Harrop and Heath¹⁸ who found an increased arterial unsaturation and diminution in the rate of pulmonary gas diffusion in the disease.

SUMMARY

1. A case is reported of polycythemia associated with partial occlusion of the inferior vena cava.
2. The suggestion is made that in this case the venous obstruction is responsible for the blood picture.
3. It is suggested that in the future any cases of inferior vena cava ligation receive careful hematologic studies including blood volume determination.

I wish to acknowledge my indebtedness to Dr. William R. Nicholson for his kindness in permitting me to report this case.

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2022 SPRUCE STREET.

(For discussion, see page 429.)

AN UNUSUAL FETAL MONSTROSITY, WITH INTERESTING PROBLEM IN DELIVERY*

BY CLIFFORD B. LULL, M.D., PHILADELPHIA, PA.

THIS case is being reported because of the rather unusual type of monstrosity, and because of the problem presented in delivery.

Patient, A. C., aged twenty-seven years, primigravida, whose last menstrual period was April 5, 1929, was admitted to the Delaware County Hospital on January 5, 1930 about one week before the estimated date of delivery. The family history was negative with no twins on either side of the family. She had the usual diseases of childhood. Her tonsils and adenoids were removed at the age of five years and there was no other serious illness or operation. Her condition during pregnancy had been satisfactory. She went into labor at 2 A.M., January 5, with fairly severe pains from the very beginning. Examination at 5 A.M., at which time she was having five-minute pains lasting one minute, showed partial effacement of the cervix with one finger dilatation. The heart sounds were heard in the left lower quadrant, about 130 in rate. At 6 A.M. she had a $\frac{1}{4}$ gr. of morphia and $\frac{1}{200}$ gr. of scopolamine. She obtained no relief from this medication and labor continued during the day with strong contractions occurring every three to five minutes. Examination at 6 P.M. showed her to be completely effaced, 3 fingers dilated and membranes ruptured. At 9 P.M. she was completely effaced with the child presenting in a L.O.A. position. At 9:30 P.M. her physician, Dr. Dick, delivered by low forceps, a living male child weighing 4 pounds and 5 ounces. Dr. Dick had suspected twin pregnancy, because of the size of the abdomen but could never hear but one heart sound. Immediately after delivery of the child it was obvious that another fetus was still in the uterus. Examination showed it to be a footling presentation. The anesthetic was withdrawn and she was allowed to make an effort to expel the other twin. After waiting some time, during which the patient bled slightly, she was again anesthetized and an attempt was made to extract the second child. At this time the diagnosis of fetal monstrosity was made, but the attempts to deliver were unsuccessful. Again the anesthetic was withdrawn and I was asked to see the patient. On examination I found a woman coming out from ether anesthesia in fairly good general condition, considering a not so long, but rather hard labor and a rather prolonged anesthetic. Her pulse was 110 but of good volume and regular. The fundus of the uterus was 3 finger-breadths above the umbilicus and was very firmly contracted. No heart sounds were heard. Vaginal examination showed a very slight laceration of the pelvic floor. There was protruding into the vagina two very small and ill-formed feet, with the cervix tightly contracted around the extremities just above the ankles. Moderate bleeding from the uterus was present. So much traction had been made upon the feet that both were torn off at this time. It was impossible to get more than two fingers by the tightly contracted cervical canal. From what could be felt, I was impressed with the enormous size of the thighs, in comparison to the very small feet and legs, and the evident size of the remainder of the fetus, from the size of the uterus. The patient was again anesthetized, and another attempt made by myself, to release the contraction ring and effect delivery by placing a traction sling around the extremities. We thought at this time we were dealing with a hydrocephalic monster. Under deep anesthesia the uterus did not relax at all, and the contraction ring remained intact. During this time there was moderate

*Presented at a meeting of the Philadelphia Obstetrical Society, March 6, 1930.

bleeding from the uterus, and after several unsuccessful attempts, with various methods of traction it was given up.

The picture now was that of a patient who had a very severe labor with ruptured membranes for several hours; four vaginal examinations before delivery of the first child; three rather deep and prolonged anesthetics; forceps delivery of the first child and two unsuccessful attempts at delivery of second child. In addition the uterus was tetanically contracted over the body of the second child. There was a contraction ring around the extremities of the child in utero with a moderate amount of bleeding from the uterus. A rather interesting if not complicated, obstetric situation.



Fig. 1.

It was decided to allow the patient to come completely out of the anesthesia, to have her typed for blood transfusion, and the patient and operating room gotten ready for abdominal delivery. If the bleeding persisted and the uterus would make no attempt at rhythmic contractions, abdominal delivery would have to be done. During the time necessary for these preparations the patient reacted quickly from the anesthesia and screamed continuously because of constant agonizing pain in the abdomen. The uterus remained in a state of tetanic contraction and bleeding persisted. Pulse rate increased and the pain became so severe that morphine with atropine and digitalis was given hypodermatically.

At 11:45 P.M. transfusion was started and she received 500 c.c. of blood intravenously by the citrate method. At the same time operation was performed under ether anesthesia. A suprapubic midline incision was made and the uterus eventrated. After packing off carefully, the uterus was incised by a transverse

fundal incision of Fritsch, and the fetal monster removed, with the placenta and membranes. The uterine incision was held closed by traction forceps, and the uterus amputated supravaginally. Both ovaries were left. The stump was carefully covered with peritoneum. A cigarette drain was carried well into the pelvis and the abdomen closed in the usual manner.

The operation was done as quickly as possible and the patient returned to her room with a temperature of 99° F. and a pulse rate of 128. Her convalescence was uneventful. There was very little distention and the temperature and pulse remained good at all times. The drain was removed at the end of forty-eight hours, skin clips on the sixth day, the wound healed by primary union except at the insertion of the drain which was entirely healed by the ninth day. She and the surviving child were discharged on the nineteenth day, both in good condition, and have remained so to this time.

The fetus weighed 6 pounds, and should be described as a homogenous mass of tissue, with no head or arms, but two lower extremities, from which the feet had been removed. X-ray, and actual photographs were made, after which the mass was dissected. This showed that there was no heart, lungs, or liver. The intestinal tract consisted of several feet of cord-like process in which there was a milky fluid. There was one kidney present with ureter. The bladder was normal and there was a well-formed, external genitalia of a male child. The portion of the head and cervical spinal column and portion of the upper extremities were entirely absent as well as the brain and upper spinal cord. There was of course, only one placenta.

This monstrosity is quite typical according to the classification of Birnbaum and Blacker, of *acardiacus-acephalus*, which is the most frequent type of this variety of abnormality. It is found almost always in homologous uniovular twins with a common placenta. The one twin is, as a rule, well developed. There are several theories as to the cause of this peculiar formation. The one most generally accepted is that there occurs an extensive anastomosis of the circulatory systems of the two children. The blood pressure predominates in the circulatory system of the one twin in such a way that the heart of this, the stronger twin, carries on the circulation of both, and the blood stream in the other twin is reversed. As a result there is either a complete atrophy or a failure of development of the heart, lungs, and trunk of the mal-formed twin. It is nourished by the normally developed one.

Fareuffi was able to collect 108 cases of *acardiacephali* from the literature. Hirst and Piersol's atlas of human monstrosities describes this variety at length and notes several instances of difficulty in the delivery. Both of these books stress the point that difficulty in delivery seems to be quite common, but all their cases that are on record were delivered per vagina, after amputation of the extremities, by placing a blunt hook through the abdomen and around the pubic arch giving a firm method of traction.

In this case the tetanically contracting uterus and the contraction ring at the internal os made this method of delivery impossible. A low cervical section was deemed inadvisable because of the suspected enormous size of the after-coming head, and from the amount of handling which the patient had, it was thought inadvisable to allow the uterus to remain *in situ*.

COMPLETE INVERSION AND PROLAPSE OF THE UTERUS. ADHERENT PLACENTA ATTACHED. SHOCK, REPOSITION, RECOVERY

BY JOHN JOSEPH GILL, M.D., F.A.C.S., CHICAGO, ILL.

(From the Wesley Memorial Hospital)

MRS. T., a primipara, American born of Italian parentage, in good general health, robust, weight 150 pounds. Her last menstrual period appeared on September 11, 1928. I first saw her February 21, 1929. The pregnancy ran a normal course except for a leucorrhea throughout the term and slight edema for the last trimester.

She was admitted to Wesley Memorial Hospital on June 22, 1929, at 10 A.M., having been in labor for six hours. The bag of waters ruptured spontaneously at 4 P.M., at which time dilatation was complete, with the occiput to the left and fixed in a deep transverse arrest.

After two hours of hard labor no progress had occurred so, under ether anesthesia, the axis-traction forceps were applied and an easy delivery of a 7½ pound baby girl was accomplished. After waiting for fifteen minutes, my assistant reached for the fundus to determine its firmness, but was unable to find it. The patient, coming from under the ether, was straining forcibly and a mass appeared at the vulva; another retching and the completely inverted uterus wholly enveloped in the placenta was projected between the thighs. No line of demarcation between the uterus and placenta could be found, so a central opening was made and the large one pound six ounce placenta was peeled off toward its periphery with only moderate bleeding. The patient was in shock; she became chalky white, the pulse reached 140 and respirations 25 per minute. The uterus was quickly and easily repositioned over my coned hand; it immediately formed a central contracting ring about my hand, which was held in the uterus and gradually withdrawn as gauze packing was inserted. The cervix and perineum presented no tears. One c.c. of pituitrin was administered. The gauze packing was removed from the uterus on the following morning. For one week, the temperature ranged around 100° F. On the tenth day, mother and child in good condition left the hospital.

5708 HARPER AVENUE.

Society Transactions

CHICAGO GYNECOLOGICAL SOCIETY

STATED MEETING, FEBRUARY 21, 1930

DR. W. C. DANFORTH AND DR. ROBERT M. GRIER presented a paper entitled **An Analysis of 124 Low Cervical Cesarean Sections.** (For original article see page 405.)

DISCUSSION

DR. JOSEPH L. BAER.—I am in complete accord with everything in this paper except the definition of test of labor; namely, complete effacement and dilatation of the cervix with one hour of five-minute pains before cesarean section is undertaken. There are many patients in whom the experienced operator will decide that the woman should be delivered abdominally when dilatation is far from complete. I am sure the essayist must modify this rigid prerequisite in many instances, justifying the exceptions by the urgency of the specific case.

I have a few statistics of cesarean section in the Michael Reese Hospital in the past twenty months. There were 2542 deliveries and in that number there were 100 cesarean sections, which is approximately 4 per cent. Danforth and Grier showed 3.7 per cent. In our series, which represents the work of our obstetric staff, all were of the cervical type except two which were Porro operations. The routine is almost uniform with only slight variations in technic. The type of anesthesia is a choice between local and ethylene-oxygen. My chief interest in connection with cesarean section is the indication. For that reason I will run through the indications which were accepted by our groups as justifiable in our 100 cases. The largest number was dystocia and disproportion, 29; toxemia, 18; contracted pelves, 13; organic heart disease, 8; placenta previa, 8; previous sections, 7; premature separation of the placenta, 4; breech, 5; miscellaneous, 8. In a series like this no one may say that in those 29 every patient was a bona fide dystocia disproportion and that section was exactly the procedure indicated in that patient. We believe that our combined judgment has been correct, but after all, that could be open to criticism, the same thing with the toxemia group. Here were 18 delivered by section in various degrees of toxemia, eclamptic or preeclamptic. Of the miscellaneous group, two were influenza-pneumonias, one of whom died. That brings me to the mortality in our series.

The operative mortality could very properly be set as one per cent. In this patient, operated upon for premature separation, there was some oozing and the doctor thought he could control it with packing. He unfortunately could not tell that it was the type of uterus which should be removed. The patient died on the table. Of the two influenza-pneumonias, one made a good recovery; the other died thirty minutes after admission. A section was done in an effort to save the baby. If that is charged to our series, we have a mortality of two per cent. If not, then we have one death in 99, which is approximately one per cent.

The technic which Danforth described for the low cervical section is that which we employ. Some of us used the Monro Kerr incision in the low cervical segment. I liked it very much but Lackner recently discovered in a repeat section that the transverse scar showed quite a thinning out. He felt if this woman had been al-

lowed to labor it would have ruptured. So I have not done one in many months. I am now using the median vertical incision.

DR. A. G. GABRIELIANZ.—There was a very interesting summary recently given of the work in Moscow. Of 309,000 deliveries in the period from 1921 to 1927, there were 743 cases of abdominal cesarean sections. Of the 309,000 there were 106 cases of eclampsia. Danforth's statistics show practically the same amount of eclampsia, 17 cases in 60,000 deliveries. During 1921 in Moscow there were 30,000 deliveries in which ten cesarean sections were performed. Due to activity of the younger generation of Russian physicians, there were 233 cesarean sections in 1927 out of 53,000 deliveries. As to the type of cesarean section, the classical and low cervical and transperitoneal cervical sections were used.

Regarding the morbidity, Danforth pointed out that this was lower in low section than in the classical. Moscow had less in the classical and much more in the low cervical. The morbidity is always less in the classical cesarean section. Seventy-one cases of transperitoneal cervical cesarean sections resulted in thirty-one cases of morbidity with two deaths; one from thrombosis of the pulmonary artery, the other from eclampsia in the presence of a goiter and syphilis of the brain.

The classical cesarean section resulted in 4.4 per cent mortality from sepsis and in the low cervical 3.3 per cent.

There were 422 cases of contracted pelvis; 127 cases of placenta previa; 106 cases of eclampsia and 88 cases based on other indications.

DR. D. S. HILLIS.—This is a most creditable report from a conservative hospital both from the standpoint of the number of sections done and from the standpoint of results. I am a little surprised, however, that the writer recommends the test of labor to be carried to the point of complete dilatation of the cervix and rupture of the membranes. I think this may be justifiable in a clinic where most of the work is done by a few men with the best technic. Such a method, in my opinion, if adopted throughout the country, would lead to more late cesarean sections than would be good for the mortality tables. The future of an early determination in labor as to whether an abdominal delivery is needed lies in a development of the impression method of the head which, in most cases, permits this diagnosis to be made before it is too late to deliver the case safely by the abdominal route and a considerable time before the cervix is completely dilated and the bag of waters ruptured. With regard to adhesions between the bladder and the anterior wall of the uterus, my experience has not been so favorable as that reported. We have found a number of cases which at second operation showed no peritoneal adhesions but with the bladder so tightly adherent to the uterus that it could not be stripped down far enough to confine the incision to the lower uterine segment. Perhaps half the cases, however, with no temperature in the puerperium showed no adherence of the bladder and the second operation was done as easily as the first. When there is fever in the puerperium after a low section the integrity of the scar may well be doubted. In two cases with stormy convalescence at the County Hospital it was found at the next operation that there was nothing but peritoneum between the cavity of the uterus and the general peritoneal cavity.

DR. RUDOLPH W. HOLMES.—Drs. Danforth and Grier have had a remarkable success with their low cervical cesarean sections at the Evanston Hospital; it is unfair to compare statistics of the present time with those of the past, even of very recent years. Progress in this operation has gone on with leaps and bounds. Whitridge Williams has declared that the line of demarcation between the "school" period of cesarean section and the application of sound principles was 1910, but every factor which influences the safety of the operation has been immeasurably

bettered, even during these last ten years. Edward Reynolds, in 1907, presented a paper before this Society showing the great advantage of primary over secondary cesarean sections; he has been credited with being the father of the principle that the only safe time for a section was before labor.

I feel there may be no question but that the postoperative reaction discomforts are less following low cervical sections in comparison to the classic, but, at times, I have had classic sections on women who had little or no postoperative discomfort. In one woman, on whom I did two sections, there was little or no discomfort, so she refused to remain in bed the allotted time. From the day of operation she wandered about the ward.

I reported 92 classic sections in 1922. I analyzed them in this manner: (a) those before labor; (b) those in labor; (c) those in labor with membranes ruptured. Tables were made of the high and low temperatures and high and low pulse rates for ten days, averages were made and from these, average graphs were made. It was clearly evident that there was comparatively little difference between the pictures in these graphs of those not in labor and those who were in labor, but there was a markedly increased postoperative thermal reaction in those women whose membranes had been ruptured for a period, even for a short time.

After reading my paper one of the audience told me I would not have had such a thermal curve if I had used the low cervical section on all my women, and he is identified with some points which have enormously improved the technic of the operation. He had just before reported a series of low sections. I took the seven cases of his series which had been longest in labor and with the longest period with membranes ruptured, treated them in the manner described above and took my seven worst cases of comparable type. When the graphs were produced, my seven cases showed the low cervicals to be infinitely worse as regards the height of the thermal curves, and the duration of the fever. When I sent this graph to him his comment, in reply, was: "You forget that there is far more tissue traumatism in a low cervical section than in a classic."

My whole contention is this, there is less peritoneal reaction after a low cervical than a classic, therefore the postoperative disturbances are less than in a classic section. As to the relative safety of the two, this is still a moot question. The classic has one advantage certainly in that it takes less time. The one way to prove the problem is for individual operators to take alternate cases without any selection, and do one series of low cervicals and the other by classic technic. I believe the results would be equally favorable.

DR. F. H. FALLS read a paper on the **Observations on the Use of Local Anesthesia in Gynecologic Operations.** (For original article see page 310.)

DISCUSSION

DR. CAREY CULBERTSON.—Dr. Falls has frankly said that he is offering these observations as one doing gynecologic work and not using local anesthesia as a routine procedure.

In taking up the discussion of this subject, I offer my remarks in exactly the same way. As a matter of fact, my observations on local anesthesia are those of one who does not use it on every occasion or make a fetish of it or try to make use of it to the exclusion of other methods. My experience with local infiltration anesthesia began years ago when Webster started to do cesarean sections by this method. Prior to that he had done an occasional case in which general anesthesia was contraindicated, an occasional laparotomy or an occasional low or plastic operation. But when he started to do cesarean sections under local anesthesia, it worked so well that he carried it out in a long series of cases already reported.

In my own experience, I have used local anesthesia, preceding the infiltration with scopolamine and morphine, using it first in cases in which general anesthesia was contraindicated, but extending indications until confidence was gained, until now it is often a method of choice. Basic technical principles which Dr. Falls has laid down are those which we have followed for years, using plenty of novocaine solution, one-half of one per cent or even one per cent. I think it helps to have the solution stained lightly with methylene blue, thus showing in the tissues definitely the extent of infiltration. In lower plastics particularly, it is helpful to add ten drops of a 1:2000 adrenalin to the ounce of novocaine solution. The important thing is to use plenty of it and to infiltrate extensively and widely beyond the area that is actually to be denuded, for instance, in lower plastic operations. One's assistants should be constantly coached not to jerk or pull unevenly, but to make steady, gentle traction. Dr. Falls emphasized that the tissues must be handled gently.

I have probably not used local anesthesia as often in obstetrics as I did formerly since we have had ethylene gas. We no longer perform cesarean sections under local anesthesia. I have not used it in episiotomy for the same reason but when it comes to gynecologic work, especially lower plastics and vaginal hysterectomy, there are no other surgical procedures, I think, which lend themselves better to local infiltration anesthesia. I have had some experience with it in other work.

I have a very definite impression that our best results are with elderly women rather than the younger. Elderly women with small doses of scopolamine and morphine and a liberal infiltration of novocaine many times do not even know that they have been to the operating room. They offer no resistance at all at the time of operation. Convalescence is certainly simplified and I do not anticipate postoperative complications. Where one operates for intestinal obstruction, colostomy or jejunostomy, or the occasional interference for some other postoperative complication, local anesthesia is admirably indicated. I have had the same experience that Falls outlined in dilatation of the cervix and exploration of the uterus, with wide infiltration of the broad ligaments. Exploration of the corpus sometimes is painful. In perineorrhaphy one has to infiltrate widely also, especially when opening the triangular fascia for muscle approximation, a procedure which I favor. Unless the paravaginal tissues are well saturated this is apt to be painful.

DR. JOSEPH L. BAER.—Having been at Michael Reese Hospital since 1904, I saw some of the early work in local anesthesia which Dr. L. A. Greensfelder had introduced when he returned from Europe with the "Schleich mixture." From that time on, in the surgical wards, infiltration anesthesia has had vogue until today. In the last few years we have taken up spinal anesthesia. I like this particularly for gynecologic work. We find the operative field is so completely exposed, the abdominal musculature being completely relaxed and the bowel collapsed, that it seems to be the method of choice. In selecting cases for infiltration anesthesia, we invariably think of cardiacs and nephritics. Here spinal anesthesia may be just as useful.

DR. J. P. GREENHILL.—At the Chicago Lying-in Hospital local anesthesia was employed in 55.1 per cent of the 874 cervical cesarean sections performed from July, 1915, to July, 1929. During the last year 92 per cent of all the cesarean sections were performed entirely under direct infiltration anesthesia. The latter rather than spinal anesthesia is preferred because it is safer and has given excellent results. The total mortality for the 874 operations was 1.26 per cent and this low mortality at least in part is attributed to the use of local anesthesia. There were only two deaths from pneumonia in this large series and both occurred after the use of ether. Local anesthesia has been found very helpful in gyne-

cologic work also, especially for plastic operations. In my experience direct infiltration with novocaine solution makes dissection of the tissues an easy task.

DR. H. O. JONES.—It seems to me that before deduction can be arrived at a comparison of the mortality and morbidity should be made under the different types of anesthesia. In our service we never use spinal or local anesthesia. We are willing to compare our mortality and morbidity under ethylene-oxygen and ether anesthesia with that obtained from either spinal or local anesthesia. Except in a very few selective cases no spinal anesthesia is used and local anesthesia has not been used at all.

DR. FALLS (closing).—I should have said that we use ten drops of 1:1000 adrenalin to the ounce. We infiltrate the sheath of the rectus and the peritoneum. Dr. Culbertson brought out an important point concerning elderly women. They are especially well adapted to the method. We have seen them sleep during a proclivita operation.

Concerning the question of its use in episiotomies, we have used it not so much to reduce pain when the incision is made because most of our patients get ether or gas, while the head is coming down, but to have its effects during the repair of the episiotomy when we have discontinued the ether and gas. We have noticed in perineorrhaphies as Culbertson also mentioned, that there is no question but that it takes more novocaine solution than it does in anterior colporrhaphy. Anterior colporrhaphy requires very little to completely anesthetize the area. In order to do a perineorrhaphy an additional injection into the muscle is often necessary.

I have not mentioned spinal anesthesia in the paper because I do not use it very much. This is a discussion on local anesthesia.

It is a study of what happens when you use local anesthesia for various types of gynecologic operations, including the ordinary major abdominal operations with adhesions, which is the factor I was most interested in. Cesarean section should not be done under local anesthesia, unless you have a contraindication for general anesthesia. I see no reason for subjecting the patient to the psychic strain of local anesthesia needlessly. The question as to whether it is ever necessary, as Dr. Jones brought out, is a personal one. He is satisfied with ethylene and can do anything he wants with it. I feel that is true in the great majority of cases, but there is an occasional case where I feel that local anesthesia is safer. One should understand how to use it and have considerable experience with the method so that one will not be handicapped in using it on the case in which it is especially indicated.

PHILADELPHIA OBSTETRICAL SOCIETY

STATED MEETING, MARCH 6, 1930

DR. CLIFFORD B. LULL described a **Fetal Monstrosity** which presented an interesting problem in delivery. (See page 421.)

DR. H. J. TUMEN read a paper (by invitation) entitled **The Association of Polycythemia with Occlusion of the Inferior Vena Cava**. (For original article see page 417.)

DISCUSSION

DR. EDWARD A. SCHUMANN.—The question of secondary polycythemia as the result of the obstruction of the vena cava was an interesting speculation, but

one that had not been definitely proved. If this be true, we must regard all cases of polycythemia as primary until we find them otherwise. We know that hemorrhage such as that which occurred in Dr. Nicholson's case is unavoidable. We also know that irradiation of the long bones and spleen within the course of a few months controls polycythemia for a period. Therefore the question arises whether it would not have been preferable in such a case, where faced with a probability of hemorrhage, to have used preliminary irradiation as a preferable procedure.

DR. EDWARD STEINFELD.—It must be understood that the question of primary polycythemia in this case is not under discussion. It was rather one of those secondary cases which are sometimes referred to as erythremoid reactions. In the primary type of polycythemia there is a very definite entity perfectly distinguished from secondary type. There is noted splenomegaly and some difficulty in the lack of normal blood destruction or more likely, excessive blood regeneration. In any event there is splenomegaly, extremely high red cell counts (10,000,000 to 12,000,000 or higher), increased reticulocytes, leucocytes and increase in hemoglobin counts. In the secondary cases there is simply the polycythemia. There is no increase of young red blood cells, nor any unusual disturbance in blood destruction, and one usually finds some discoverable cause, such as cardiac, pulmonary, or mediastinal conditions. This particular case under discussion belonged to the secondary type, and there was some congestion in the branches of the superior vena cava by way of collateral circulation from the inferior vena cava.

The importance to the surgeon in this type of case lies in the possibility of hemorrhage due to engorged venous circulation in the operative area. In addition the presence of a count above normal may give a false sense of security. There is also a possibility that the presence of polycythemia associated with an abdominal tumor may be of help in an estimation of the degree of posterior attachment of the mass.

DR. WILLIAM R. NICHOLSON.—This case was one of a very large fibroid which had been growing rapidly and was mechanically becoming incompatible with life. Upon operation the tumor was found to be universally adherent. The whole abdomen from the pelvic floor to two fingers above the navel was filled with the fibroid mass which was degenerated and universally adherent to the parietal peritoneum of the anterior and posterior abdominal walls, and also having wide thick adhesions to the diaphragm at its upper pole. An attempt was made to separate the adhesions with the hope that the anterior abdominal wall adhesions were simply local and that after these had been separated it might be possible to deliver the tumor. Hemorrhage was immediately so excessive that packing had to be resorted to and the woman died within a few hours after removal from the table. Even the round ligaments could not be isolated from the mass of adhesions and the ovarian arteries could not be found. The only comparable condition which I have ever seen was a similar case of fibroid many years ago where the old electrical treatment had been used. In this case, however, no such treatment had been given. The adhesions here were the result of the degeneration of the tumor. The interest in the case really was on the medical side. The use of the x-ray in this particular tumor, taking into consideration its size and universal adhesions as suggested, would have been bad treatment.

DR. TUMEN (closing) said that with regard to the differentiation of the false from the true polycythemia, he used the term here because of the possibility of confusing it with a case of true polycythemia. There had been, he said, an excessive amount of blood found as shown by the blood count. The collateral circulation was probably so developed with the caval system that a blood count taken anywhere in the upper portion of the body would have shown an increase.

As to the possibility of operative hemorrhage, in most cases this does not seem to be a very great danger, because blood-letting was used so universally at one time.

Irradiation would probably not have been helpful, Dr. Tumen said, because in the event that the increased blood cells were due to venous obstruction, there would be no overactivity of the bone matter.

As to the question of whether or not we did have true polycythemia, this was not such a case. It was a case of the disturbance of the blood distribution.

DR. L. S. McGOOGAN OF FALL RIVER, MASS., presented a paper (by invitation) entitled **Contracted Pelves and Disproportion**. (For original article see page 386.)

DISCUSSION

DR. JAMES W. DUNCAN, MONTREAL (by invitation).—May I be permitted, before discussing this very excellent paper, to draw your attention to certain important points. The Royal Victoria Montreal Maternity, in so far as the private wards are concerned, is an open hospital. A large minority of the private patients are delivered by nonmembers of the hospital staff. Complete statistics in these cases are, therefore, difficult to obtain.

The mortality for this whole series is an expression of the total fetal loss, without the slightest suggestion of selectivity. It is participated in by the general practitioner, the intern and members of the permanent staff.

The total number of cases studied by Dr. McGoogan was 5782 with a gross fetal wastage of 6.8 per cent. Subtracting the nonviable children and including all premature babies this figure would be reduced to 4.5 per cent.

Dr. McGoogan's series of 471 cases of labor in contracted pelves show us a gross infant loss of 51 or 10.8 per cent. Nine of these were monstrosities. Therefore, the actual preventable deaths were 42 or 8.9 per cent.

The question presenting itself to us is not how favorably do these results compare with those of other clinics, but rather, what changes may we introduce to improve our own.

Our attitude up to the present toward cesarean section has been a rigid one. Some may look upon us as radical in our conservatism. May I be permitted to enunciate it. We do not favor the trial of labor preceding the operation. Our trust in mercurochrome, associated with a DeLee or Beek operation is not deeply rooted. If the membranes have been ruptured or the patient in definite labor for two hours or more, we consider the route by this operation selectively closed. In fact, elective cesarean section is practically the sole method used for this operation in our clinic. Our procedure in all these problem cases has been the same. The use of Müller's test under anesthesia if necessary, and the decision in favor of induction, trial of labor, or an elective section is definitely and finally made. We are influenced, more particularly in young primiparae, by our own firm belief that "once a cesarean, always a cesarean." We frankly admit, that with a more surgical outlook, the fetal mortality might have been much reduced, but what of the maternal loss?

In rebuttal to the possible advocacy of a more liberal attitude, your attention may be drawn to a fetal loss which has been but 2 per cent above the low average of 6.8 per cent for the total clinic of nearly 6000 cases, and on the other hand too much emphasis cannot be placed on a total maternal mortality of 2 or 0.4 per cent.

One of the most instructive features of Dr. McGoogan's effort is the demonstration of the flat and funnel pelvis as the chief offenders, the flat pelvis contributing 51 per cent and the funnel 18 per cent of the fetal death rate. A strik-

ing point exhibited in this paper is that all losses in the funnel pelvis series had an associated posterior position. The development of a small baby by the generally contracted woman is not only interesting but assuring.

The futility of depending upon any artificial method of delivery, by forceps or version, with the hope of justifiable success is thoroughly exposed. Dr. McGoogan has exhibited the success of induction. In future we will be more influenced by the experience.

The head will, in future, have to respond more readily to Müller's test in the flat pelvis, and the complete rotation of the posterior position of the occiput will be a matter of insistence in funnel pelvis before the head reaches the outlet. Consequently, both induction of labor and elective section will, without doubt, be utilized more frequently in the future.

DR. NORRIS W. VAUX said he quite agreed with Dr. Duncan on the question of cutting down fetal mortality by use of breech extraction and of Dr. Piper's after-coming head forceps. There was also a great saving of lacerations of the cervix and perineum. He did not think, however, that they quite agreed as to the time to do such delivery. He thought that if the case was allowed to go along until the cervix is dilated with the membranes unruptured and until it is definitely certain that the position is posterior, then it is much better not to let the delivery wait too long. When, however, ruptured membranes are found at the onset of labor with a rather large child, he lets them go ahead and never attempts to do a version in such cases, except where obliged to do something to effect delivery. He usually rotates the head manually or with the Tucker-McKlane forceps or the Piper forceps. He said he heartily agreed with Dr. Duncan that version should not be done except as a last resort.

DR. WM. R. NICHOLSON said that in his experience of ruptures following cesarean operations, these occurred in three cases before the women went into labor, or before labor had progressed far enough to either rupture the membranes or cause any dilatation of the cervix. His belief is that rupture depends primarily upon the situation of the placenta in pregnancies following previous cesarean sections. If the placenta is not in relation to the old wound, the majority of cases which have had previous cesareans can be delivered vaginally with safety. On the other hand, if the placenta develops immediately upon the inner surface of the old wound, the tendency of the syncytial cells to invade the uterine wall so weakens the scar by absorption that rupture is very probable. Dr. Nicholson does not believe that induction of labor is as frequently indicated as the essayist's statistics indicate. His belief is that except in cases of toxemia, induction either for contracted pelvis or postmaturity is very rarely indicated. He felt that any man who has had sufficient training in obstetrics can determine after seeing a woman in early labor for a few hours whether it is better to deliver by vagina or by cesarean section. This is a different attitude from that held by those who advocate a true test of labor. In other words, it is impossible until a woman has had marked second stage pains for a longer or shorter time, to absolutely determine whether the head will or will not eventually enter the pelvis, but it certainly can be told before the so-called test of labor has been given as to whether it is better in any individual case to deliver by abdominal section or through the vagina. That one is willing to advocate an abdominal section for a kinked appendix, as the better method of treatment, and yet so unwilling to advocate a cesarean section at the time which is proper for its performance, namely early in labor, is rather a remarkable proof of the lagging of obstetrics behind abdominal surgery. Of course, such a decision presupposes real obstetric knowledge, which can only come through long experience, and it goes without saying that some needless abdominal operations will be performed. It is further to be always remembered that

we are discussing this subject as experts in obstetrics. The ordinary practitioner has no business with obstetric complications and is no more competent to safely induce labor than he is to perform a cesarean section or to decide upon the indications for either procedure.

DR. COLLIN FOULKROD said he thought it would be stimulating to collect such statistics in Philadelphia from the standpoint of the Montreal attitude. There were one or two points that differ so much that he felt it would be very interesting to discuss them.

One was the question of why so many babies died from intracranial hemorrhage, as it was rather higher than one would expect, particularly with the use of low forceps. He would like to know what type of forceps were used. He also said he was sure that a long labor was more likely to produce intracranial hemorrhage.

With regard to the induction of labor, he said it had grown to be rather an unusual practice to induce labor for other causes than toxemia. It seems to be the Philadelphia attitude to have discarded the use of the induction of labor as based on any classification of the pelvis from a record of the conjugate vera.

The question of whether to do a section in subsequent pregnancies usually depended upon whether the patient showed a temperature indicating any morbidity when convalescing from the first section. Whereas he said there had been many cases where a woman had had cesarean section for some condition, and yet had had two or three babies subsequently. Once a cesarean did not mean always a section.

DR. JOHN A. McGLINN said that in instances of very young girls with very small pelves, the baby also is usually contracted and as a rule such cases do not give much trouble, so that he felt there was no greater incidence in the generally contracted pelvis than in the normal case. The funnel or simple flat pelves were usually amenable to cesarean section. He said he advocated the Beck or Kerr sections, as he felt they both gave a better chance to both mother and baby, and not one alone.

DR. DANIEL LONGAKER said he was certain that if the Kielland forceps were used, intracranial hemorrhage would be entirely avoided. He was equally certain that the sad tale of the dead and the crippled baby was directly due to the use of ordinary forceps and the impossibility of correct application and therefore the intracranial hemorrhage!

DR. McGOOGAN (closing) said that with regard to induction of labor in these 56 cases out of 471, or 56 cases out of 251 operative cases, this was part of the teaching in Montreal, and that in a good many cases it was thought better to induce labor at the eighth or eighth and a half month, especially in young women, than to do a cesarean section.

With regard to intracranial hemorrhage, he said he was sure the question cannot be answered as to whether this is due to the contracted pelvis or to the forceps. He said that at the Royal Victoria Hospital they did not use the Kielland forceps.

Department of Book Reviews

CONDUCTED BY ROBERT T. FRANK, M.D., NEW YORK

Review of New Books

A beautifully illustrated and gotten up book, *Die weibliche Brust*,¹ dealing with the female breast, including its hygiene and a retention of its form, has been produced by Gläser and Amersbach. The introduction to this volume is by C. Menge. The main object has been to present both the medical profession and the laity with an understandable brochure whose object is mainly the prevention of the diseases of the breast by means of preventive measures. Exercise and recognition of malignancy are also dealt with. The illustrations are most instructive and artistic.

—Robert T. Frank.

Dr. Ray has compiled in this pamphlet, *Some Problems of the Medical Profession in India*,² a number of addresses, resolutions, and editorials regarding some problems of the medical profession in India. These problems relate not only to the native medical profession but also to the Indian Medical service. The greatest of the problems is apparently that of the present situation of the native Indian practitioner educated in medicine in India. It is difficult for us to realize the situation under which these men work, due probably to the parallel civil and military medical services in India. The native practitioners have asked for a separate Medical Council for India and for recognition by appointments in the Medical Research Institute which would lead to promotion. It is interesting to note that a new central Medical Research Laboratory has been founded under a grant by the Rockefeller Foundation. Other problems of medical interest, in hygiene and sanitation, are discussed.

—Philip F. Williams.

Dr. Peterson presents an excellent small *Manual for a Demonstration Course in Obstetrics*.³ Since he has introduced a large amount of clinical practice the book might well serve, not only as a manual for Manikin courses, but also as a practical obstetric help for the student and the general practitioner.

—Philip F. Williams.

The present third edition of this textbook on obstetrics, *Lehrbuch der Geburtshilfe*,⁴ edited by Dr. W. Stoeckel, bears evidence of a critical revision.

The present edition is revised by the same authors who wrote for the previous one, except Opitz and Reifferscheid, who have died in the interim.

There is an ample discussion of the advances in the physiology of the reproductive organs of the female, menstruation, early pregnancy changes, and the interrelationship of the various endocrine glands. Later in the chapter on physiologic biology of pregnancy, the changes and influence of the anterior pituitary body are taken up in detail, with reference to Zondek and Aschheim's work.

¹*Die weibliche Brust.* Von Dr. Med. E. Gläser u. Dr. Med. R. Amersbach. Mit einem Geleitwort von Dr. med. C. Menge. Ferdinand Enke, Stuttgart, 1929.

²*Some Problems of the Medical Profession in India.* Compiled for the All-India Medical Association by Dr. Kumud Sankar Ray. India, 1930. The Indian Daily News Press, Calcutta.

³*A Manual for a Demonstration Course in Obstetrics.* By Reuben Peterson, A.B., M.D., F.A.C.S. Edwards Brothers, Ann Arbor, Michigan, 1929.

⁴*Lehrbuch der Geburtshilfe.* Von Prof. Dr. W. Stoeckel. Dritte Auflage. 614 Abbildungen im Text. Verlag von Gustav Fischer, Jena, 1930.

Walthard in his section on asepsis and antisepsis in obstetrics, discusses the relative merits of rectal and vaginal examinations in labor, and gives the statement that maternal morbidity is six and one-half times as great following vaginal examination as when the course of labor has been followed by rectal examination. He also brings out other means and measures to reduce maternal morbidity and mortality.

Döderlein's contribution consists of an excellent and rather unusual chapter on the medicolegal aspects of obstetrics.

Ottow in considering the therapeutics of labor strongly advises caution in the use of extracts of pituitary gland during labor; he discusses the dangers and limitations of this and similar drugs and the accidents resulting from their use. He has culled from the literature, also, adverse reports on two rather recently offered drugs, one a substitute for pituitary solutions and the other a substitute for ergot. A comparison of these reports with the advertising literature of the manufacturers is interesting.

The teaching recommended is for the most part conservative, a modified Stroganoff technic for convulsive toxemia, cervical cesarean practically always where section is indicated, no fulsome praise for the Kielland forceps.

The illustrations are the usual excellent German work, many are cuttings from motion picture films of actual deliveries, which permits a very exactly timed illustration for a corresponding point in the text. It is of interest to note that there are more illustrations adapted from De Lee's textbook than there are references to American literature in the voluminous chapter bibliographies.

—Philip F. Williams.

In the *Foundations of Experimental Psychology*,⁵ edited by Carl Murchison, we welcome a really living book dealing for the most part with actual pieces of research in an attempt to "clean the debris from the intellectual decks of psychology." It is at the same time comprehensive and compact and the form leaves nothing to be desired. The outstanding note that is struck is one of modesty and the fullest realization of present-day limitations imposed by insufficient data and the complexity of the factors involved.

This book should serve not only as a record of the present status of each of the specialties of experimental psychology, not only as a guide to the prospective investigator, but as a complete textbook including in its 900 pages a thoroughly adequate perspective of the whole subject. In addition it is a source of pleasure and stimulation to the student, young and old, in any field of scientific investigation, in that it delimits so cleanly the various logical possibilities and impossibilities of proof.

The men cooperating in this well-rounded symposium form an illustrious roster of workers, each of whom, in turn, has to his credit a large zone of research influence. There are few if any fields of science in which the country can be more justly proud of its representation.

The reviewer would like to call special attention to the clarity of T. H. Morgan's epitome of the present status of the rôle of Genetics concerning the glands of internal secretion. Morgan's entire article is a model of succinctness. W. J. Crozier's mathematical approach to the study of living organisms will prove of value to the advanced student. In his chapter on The Mechanisms of Reactions, Alexander Forbes has very well formularized an enormous amount of material. Among the chapters devoted to special sense organs, the one on the Nature of the Photoreceptor Process by Selig Hecht, is particularly stimulating. W. B. Cannon's chapter On Hunger and

⁵*Foundations of Experimental Psychology*. Edited by Carl Murchison. Clark University Press. Worcester, 1929.

Thirst is briefer than it might have been; this was undoubtedly due to the fact that it was completed at extremely short notice.

The section on the Neuro-humoral Basis of Emotional Reactions includes a number of points of interest to clinical neurologists as well as some checks upon the more enthusiastic behaviorists. K. S. Lashley in his discussion of the Nervous Mechanisms in Learning, emphasizes particularly the great necessity of accumulating far more data to supply the present lack. W. S. Hunter's description of the Experimental Studies of Learning again serves to indicate the difficulty of the subject rather than clarify the atmosphere. One would expect in such a bibliography as is quoted a somewhat greater emphasis on the evaluation of emotional factors in learning.

One can only marvel that Arnold Gesell's summary On Infancy compacts his fascinating contribution in so narrow a space. This and the subsequent chapters by R. Pintner and F. N. Freeman make excellent, authoritative reading on the subject of mental tests.

Mark A. May had a most difficult task in his attempt to complete the subject on the Adult in the Community in 50 pages. In this chapter as well as in those by C. Wissler on Conflict With the Survival of Cultures and by S. I. Franz on the Abnormal Individual, there has been a shifting from genuine experimental psychology to a plea for the utilization of experimental psychologic methods. Here the reviewer regards their evaluations of the Freudian contribution really quite inadequate, and their bibliography uneven, if it be intended as a guide for the student. Franz's discussion of psychiatric problems, hysteria for instance, would be misleading for the novice and quite unsatisfying to the experienced observer.

—Max D. Mayer.

This is an excellent book, *Sa maternidade, conselhos e suggestoes para futuras mais*,⁶ for the expectant mothers. It is well written and contains many indispensable suggestions on prenatal care. On account of the high infant mortality in Rio de Janeiro, of 184 in 1925, as compared to only 64 in the same year in New York City with its high foreign population, there is no doubt that this little volume will serve a most useful humanitarian purpose. The subject matter is divided into eight chapters and covers in simple language the physiology of pregnancy, and care of the infant.

—Julius E. Lackner.

—Sydney S. Schochet.

Voltz presents in his book, *Die Strahlenbehandlung der Weiblichen Genital-Karzinome, Methoden und Ergebnisse*,⁷ a very complete and detailed analysis of 3,500 cases of carcinoma of the female genital tract treated solely with rays during the past seventeen years at the München Universitäts-Frauenklinik.

In his introductory note, Prof. A. Döderlein favors the ray therapy of genital carcinoma and thinks it should replace the operative treatment.

Voltz also includes in his book the methods and experiences of other large clinics, such as the Radium Hemmett in Stockholm and the Radium Institute of Paris. There is a report of several members of the Radiologic Commission, formed in 1928 to study the ray treatment of malignancy, especially of the female genital tract.

He gives a very detailed description of the technic and dosage used at the München Frauenklinik. The series are eight weeks apart. Usually two series suffice.

⁶*Sa Maternidade, Conselhos e suggestoes para futuras mais*. Dr. Arnaldo de Moraes. Rio de Janeiro. Graphica Sauer, de Fred. H. Sauer. 1930.

⁷*Die Strahlenbehandlung der Weiblichen Genital-Karzinome. Methoden und Ergebnisse*. Prof. Dr. Friedrich Voltz, Leiter der Strahlenabteilung der Universitäts-Frauenklinik, München, 1930. Berlin, Urban and Schwarzenberg.

At the first series, the hypophysis is rayed in order to make the cancer cells more sensitive to rays.

Since 1917, every carcinoma patient gets an injection of 10 c.c. of Dextroid. This causes the cancer cells to become more sensitive to radium and x-ray.

He devotes a chapter on the results in his clinic and another on the results from the world's literature.

Dr. Heymen gives a résumé of the technic and the results of treatment at the Radium Hemmett in Stockholm, while Dr. Lacassagne describes the technic at the Radium Institute at Paris—locally, with radium, and with deep x-ray and radium.

This book is the last word on the ray treatment in carcinoma of the female genitalia. It is scientifically written, a clear statement of results, and a very valuable addition to the literature on x-ray therapy of carcinoma of the female genitalia.

—Julius E. Lackner.

—Sydney S. Schochet.

Dr. Fekete attempts⁸ neither to write a textbook, nor a special treatise on gynecology or obstetrics. He writes on the relationship of gynecology and obstetrics to the general organism and also covers problems in gynecology and obstetrics that are only superficially touched upon in the average textbook.

The chapters on the anatomy and physiology of the uterus, tubes, ovaries, and vagina are handled in an interesting manner. Fekete emphasizes the importance of a closer relationship between the physiologist and the gynecologist and obstetrician.

Sterility has not been given much importance. The chapters on the relation of the endocrine system and the central nervous system to the female genital system are very interesting and instructive. The subject of sex hormone is discussed in a very sensible manner.

Probably the most significant and most complete chapter in Fekete's book is that on the metabolic changes during pregnancy, which are discussed in great detail.

This book is well written and contains many enlightening discussions of gynecologic and obstetric questions.

—Julius E. Lackner.

—Sydney S. Schochet.

⁸Die Funktion der Weiblichen Geschlechtsorgane und Ihre Beziehungen Zum Gesamtorganismus. Dr. Alexander V. Fekete, Privatdozent Oberarzt der Graf-Ap-ponyi-Poliklinik in Budapest. Berlin, 1930. Verlag Von S. Karger.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Selected Abstracts

Cesarean Section

Winter, G.: The Collected German Cesarean Section Statistics for 1928. Zentralbl. f. Gynäk. 53: 1874, 1929.

Statistics on 4450 cesarean sections were collected as follows:

| INSTITUTIONS: | NUMBER OF INSTITUTIONS OF EACH KIND | NUMBER OF SECTIONS | ENTIRE MORTALITY PER CENT | MORTALITY DUE TO OPERATION PER CENT |
|--|---|-----------------------|---------------------------------|--|
| University clinics | 25 | 1178 | 8.6 | 5.3 |
| Midwife institutions | 20 | 786 | 6.6 | 3.8 |
| Public institutions, no instruction given | 22 | 410 | 5.0 | 2.9 |
| Hospitals with obstetrical clinics and an obstetrician | 106 | 1093 | 6.9 | 3.5 |
| Hospital without obstetrical clinics and without obstetricians | 125 | 609 | 7.0 | 4.6 |
| Private obstetrical clinics | 70 | 337 | 6.2 | 3.6 |
| Private surgical clinics | 11 | 37 | 5.4 | 5.4 |

In the 4450 operations, the average of mortality was 7.1 per cent. Causes of death were divided as follows:

| | |
|---|---------------------|
| Death due to the disease or the condition for which the section was done, | 120 or 2.7 per cent |
| Death due to the operation alone, | 185 or 4.2 per cent |
| Death due to intercurrent disease, | 11 or 0.3 per cent |

Of the 185 deaths due to the operation itself, 53 per cent were due to infection, and 15.1 per cent due to emboli!

The whole series was further divided to show the results in (1) cases which were afebrile at the start of the operation, and (2) cases infected at the start. The mortality in Group 1 was 6.4 per cent and in Group 2, 27.0 per cent, showing definitely the danger of cesarean section in infected cases.

When the cases were grouped according to the type of operation employed, the following was found:

| | |
|-------------------------------------|---|
| Intraperitoneal cervical section | employed 3354 times, mortality 3.7 per cent |
| Intraperitoneal "classical" section | employed 438 times, mortality 6.4 per cent |
| Intraperitoneal fundal section | employed 34 times, mortality 8.9 per cent |

thus showing that the intraperitoneal cervical section, of all the operations, is the safest.

In the infected cases:

| | |
|--|-----------------------|
| 114 operated with cervical section, 'there was | 25 per cent mortality |
| 23 operated with extraperitoneal section, | 30 per cent mortality |
| 9 operated with Porro section | 44 per cent mortality |

In the 4450 cesarean sections there was a fetal mortality of 403, or 9.0 per cent.

It was difficult to get statistics on the condition of the child before the beginning of the section, but the following was established definitely: 175 of the babies were dead before the section was started. Of the remaining 228 it is certain that some of them were not in good condition at the start of the operation.

The indications for abdominal cesarean section in the main were divided into the three great groups: contracted pelvis, eclampsia, and placenta previa. These groups comprised three-fourths of all the sections. Many and divers indications, some of them quite weird, made up the rest.

The general mortality then was 7.1 per cent, with 4.2 per cent actually due to the operation itself. Winter says that there is no vaginal operation that approaches anywhere near to this figure.

WILLIAM F. MENGERT.

Gauss: *The Approaching Decline of Cesarean Section (Kaiserschnittdaemmerung)*. Zentralbl. f. Gynäk. 53: 1154, 1929.

The indications for cesarean section are divided into two groups: maternal and fetal. Under "maternal" are classed contracted pelvises of severe grade and severe intercurrent organic diseases (heart, lung, kidney). Placenta previa and eclampsia are classed as fetal indications because maternal life is conserved equally well, if not better, by methods other than section. The author denounces cesarean section for fetal indications on the following grounds:

In a series of 941 pregnancies occurring after previous sections, only 25 per cent had a spontaneous birth and 57.5 per cent had another section. In a series of 79 women with 1 previous section, only 58 per cent became pregnant again. This percentage drops to 15 after two previous sections and to 3 after three previous sections.

Ten per cent of all women having the first section, 13 per cent at the second section, 36 per cent at the third section, and 100 per cent of all women having four sections were sterilized at the Universitaets-Frauenklinik at Wuerzburg.

The collected result of all this is that a marriage in women in whom sections are done produces only 1.8 children, whereas the productivity of a single marriage in order to maintain the population should be 3.46 children. The author, therefore, concludes that a section done for a fetal indication, i.e., placenta previa, eclampsia, is not justified because the life of a single child (except in very exceptional cases) is nothing compared to preserving the health, fertility, and the ability to bear children in the natural way, of the parturient woman.

WILLIAM F. MENGERT.

Ponomareff, A.: *Cesarean Section in Russia*. Gynéc. et Obst. 18: 103, 1928.

This is a statistical review of all available records of cesarean sections. From 1881 to 1890, 61 cesareans were performed with a mortality of 50 per cent; from 1891 until 1900, 125 with a mortality of 17.6 per cent; from 1901 to 1924, 803 sections are recorded with a mortality of only 7 per cent. This gives a total mortality of 12.6 per cent with a marked decline in the mortality of each successive decade. Saenger's classical operation was performed in 901 cases with a mortality of 10.7 per cent, the Porro operation in 76 cases with a mortality of 29 per cent. Where repeated sections were done there was a mortality of 12.7 per cent for the

first operation as compared to 6.2 per cent for the second operation. A third operation was performed only in three cases with a single death. In the total series of 1,017 operations, 905 babies were known to have been born living, 23 were dead.

There were 298 sections performed subsequent to the rupture of the membranes with a maternal mortality of 22.1 per cent, while in 439 operations performed prior to the rupture of the membrane the mortality was only 5.4 per cent.

GOODRICH C. SCHAUFLEK.

Piper, Edmund B., and Bachman, Carl: Corporeal and Cervical Cesarean Section. *Surg. Gynec. Obst.* 49: 547, 1929.

A comparative analysis of results in cervical as contrasted to corporeal cesarean section appears to justify the following comments:

When the conservative operation is performed through a low uterine incision there will be found to be little difference in immediate convalescence as contrasted with that of the cervical section, if both are done as elective operations before labor. After the onset of labor there will be some advantage as to safety, febrile morbidity, and other factors of convalescence in favor of the cervical section. The advantage in the authors' hands up to this time has been so slight, however, that while hesitating to recommend a stand which would be at odds with newly reported experience in other quarters, they believe that there is yet hope for increased safety in the relatively simple corporeal operation after the onset of labor. While no assurance of safety in section removes the necessity for good obstetric judgment in the conduct of cases of questionable disproportion, surgeons who now resort to elective section in preference to the risks of operation late in labor, or because of the difficulties of the cervical section, may find it possible safely to employ test labors more frequently. By so doing they may find a further gratification in a diminished necessity for resort to section generally.

As for the thesis now advocated that the cervical section should replace the corporeal operation as a routine method in all cases requiring operation, the authors' results would suggest that the decision might conceivably be made upon other grounds than the alleged greater safety and smoother convalescence of the cervical section. For the practical obstetric surgeon there is the theoretical advantage that the scar of the cervical section, situated as it is in a quiet sector, is less apt to rupture in subsequent pregnancy and labor.

WM. C. HENSKE.

Süssmann: Two Rare Cases of Rupture of Uterine Scar Following Cervical Cesarean Section. *Zentralbl. f. Gynäk.* 53: 410, 1929.

Inasmuch as the rupture of scars of cervical or low flap cesarean section is relatively rare, the following two cases are reported.

Case 1.—Para ii, rachitic flat pelvis, diagonal conjugate 10 cm., previously delivered by cervical section, had labor pains ceasing spontaneously one week before elective section for the present pregnancy. Part of the placenta protruded through the old scar. Mother and child survived. Case 2.—Para v. Three normal deliveries and then a cervical section for placenta previa with the fourth pregnancy, followed by a temperature of 101.5° postpartum. She became pregnant again and bore down with the onset of labor pains. A sudden, sharp, severe pain ensued and fetal movements ceased, not to recur. On admission the abdomen was rigid and fetal heart sounds were absent. Laparotomy showed the fetus and placenta free in the abdominal cavity. Death occurred on the ninth day from general peritonitis. Both the laparotomy and the autopsy findings proved that this was not a primary abdominal pregnancy.

WILLIAM F. MENGERT.

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IN OCTOBER, 1920, the AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY was presented to the medical profession for its approval in the belief that the importance of obstetrics and gynecology as integral parts of medical art and science merited and would warrant the publication of a monthly periodical dedicated to this specialty.

From its beginning the AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY has been conducted by medical men in the interests of the profession, with the general conduct of the enterprise vested in an advisory editorial board, the membership of which should serve as a guarantee that these interests have been adequately protected and assured. A liberal editorial policy has been maintained toward the specialist as well as the general practitioner of medicine, and we believe that this catholicity has contributed greatly to the value of the publication.

The success of the JOURNAL may be measured by the demands of contributors for space in its columns. Twice since its founding have the number of pages per volume been increased until it was felt that the practical limits of expansion had been reached. It was therefore found necessary to restrict the privilege of publication to American authors, and numerous applications from foreign sources have been regretfully declined.

The editors and publishers are happy to record the successful career of the JOURNAL, both in circulation and popularity. The JOURNAL now represents in an official capacity the national and most of the local gynecologic and obstetric societies of the United States and publishes their papers and proceedings. In addition the various departments, each with its responsible editor, have grown in importance. The Abstract Department in particular has expanded until it includes 27 members familiar with all the living languages, so that it is possible in a limited space to acquaint our readers with the progress of the world in obstetrics and gynecology.

The JOURNAL has reached now the tenth milestone in its progress. The task of building has been a difficult one and for the editors almost solely a labor of love. But we feel that it has been a worth-while effort and we are proud of the success thus far attained. We are grateful to the many friends who, by their help and counsel, have stimulated us in this work, and to the many contributors and subscribers who have made possible the material success of the venture. Deeply interested as we have been in the growth and development of the JOURNAL, it is but natural for us to hope that many milestones may yet be needed to record its further progress.

GEO. W. KOSMAK, M.D.

HUGO EHRENFEST, M.D.

Original Communications*

POSTSALPINGECTOMY ENDOMETRIOSIS (ENDOSALPINGIOSIS)

BY JOHN A. SAMPSON, M.D., ALBANY, N. Y.

(From the Gynecologic and Pathologic Departments of the Albany Hospital and the Albany Medical College)

THE healing of operative wounds has been of great scientific and clinical interest to the medical profession. For these reasons a vast amount of work has been done in the study of this process both in lower animals and in human beings. The appearance of appendectomy scars suggests, and a review of the literature on intestinal repair demonstrates the remarkable manner in which the healing of operative wounds of the intestine occurs with the preservation of the normal relation between the mucosa and the wall of the viscus. From these studies we realize that the healing of operative wounds of hollow viscera are governed by a most important and fundamental law. This law might be stated as follows: the growth of the epithelium of a hollow viscus, which has been initiated by operative injury, is confined to the repair of the lining of the viscus; it does not actually invade the wall of the organ; it ceases to grow when the wound is healed and when transplanted in immediate or remote operative wounds it does not live. Fortunately for both patient and surgeon this law is generally obeyed. While violations do occur in the healing of intestinal wounds they are infrequent, often transitory and usually of minor significance. There is one striking exception to this rule, and that is the behavior of tubal epithelium in the repair of salpingectomy wounds. This is shown in our study of tubal stumps following salpingectomy and tubal sterilization, as will be discussed later.

There is an old saying, homely but fitting and true, that "good fences speak for good neighbors." The fences, some easily seen and others invisible, which are placed in and about the tissues of the human body, are good fences. They both protect and restrain, and thereby preserve tissue balance which speaks for harmony and the welfare of

*All of the papers published in this issue were read at the Fifty-fifth Annual Meeting of the American Gynecological Society held at Hot Springs, Va., May 19-21, 1930. The remaining papers and the discussions will appear in the November issue of this JOURNAL.

the individual. We have learned that as a result of operative injury fences are torn down and tissue balance is disturbed. This is followed by the process of repair. Should the organ or structure injured be lined or covered by epithelium, epithelial as well as connective tissue cells grow and take part in the repair of the injury. As a result fences are repaired, tissue balance is fully restored and the normal relation between epithelium and connective tissue is usually preserved.

The examination of the head of the cecum, after a previous operation in which the appendix has been removed, demonstrates that the site of the appendicectomy usually differs in no way from the rest of the cecum save for the possible presence of a scar on its peritoneal surface. This is irrespective of the technic of the operation, whether it be simple ligation of the stump, ligation with invagination or excision with closure of the opening in the cecum. There is no gross evidence of an invasion of the walls of the viscus by its mucosa such as can readily be detected in a large percentage of salpingectomy stumps.

Mall¹ made a very important contribution to our knowledge of the repair of operative wounds of the intestine, in his study of the healing of circular suture (end-to-end anastomosis) of dogs' intestine. He divided the repair of these wounds into four stages: (1) the immediate union of the serous surfaces by fibrin; (2) the destruction of redundant tissue in the flaps; (3) the regeneration of the mucosa, and (4) the straightening of the intestine at the site of the repair. He found that at the end of two months all the intestinal coats were fully regenerated. The line of suture could hardly be detected microscopically while macroscopically it was marked by a thickening of the intestinal wall. In some of the specimens the mucosal glands had apparently invaded the wall of the intestine, at times forming "adenomatous cysts." Mall believed that this arose from the downward growth of the epithelium into rents in the intestinal wall caused by sutures penetrating the mucosa and tearing the submucosa. He states: "It is possible that these cells, when once fully liberated, could do considerable mischief."

Sabin² has reviewed Mall's work and from her own studies of the healing of intestinal anastomoses she explained the lack of clinical significance of the downward growth of mucosal glands into breaks in the intestinal wall. She believes that the subsequent growth (repair) of the muscularis mucosae about these newly formed glands restores them to their normal position in the mucosa.

Flint³ described the results of the healing of gastroenterostomies based on a series of experimental work in animals. He found that there was always a regeneration of the mucosa and submucosa but that the repair of the muscularis mucosae and muscle layers was generally incomplete. The epithelial cells appeared to regenerate in an orderly manner and did not actually invade neighboring structures. When the muscularis mucosae was torn or failed to regenerate glands of the mucosa might grow down into the submucosa.

McWhorter, Stout and Lieb⁴ reported the process of repair in sutured wounds of the small intestine. They examined more than thirty-two specimens, and compared their observations with those reported in the literature. They stated that after two months the mucosa was completely regenerated and could not be distinguished from the surrounding undamaged mucosa. Complete anatomic regeneration of the muscularis did not occur. A realignment of the infolded muscular fibers took place but it was always interrupted by a thin line of scar tissue. The cysts

and tubules of intestinal mucosa in the walls of the intestines described by Mall were observed by these writers in four of their cases. They usually occurred about buried sutures and appeared to be of purely pathologic interest and not of any surgical importance.

Fraser and Dott,⁵ in describing the results of their experimental intestinal anastomoses in dogs, speak of the "extraordinary powers of adaptation and reconstruction which the tissues of the bowel possess. The mucous membrane showed perfect regeneration." In cases of ileocolostomy the mucous membrane of the small intestine, within a few millimeters of the junction, underwent a metamorphosis to a colonic type. Even in this operation it was impossible to identify the mucous membrane junction after about eighty days.

Lee⁶ in the discussion of his experimental end-to-end anastomosis of the colon in dogs states that in all of the anastomoses, which were thirty days old or more, the mucosa had healed completely. He found that "the mucosal glands at the site of anastomosis were much larger than the ordinary ones, with individual cells longer, and with much greater evidences of cell proliferation. Moreover, these large young glands showed marked cell division in certain regions in which the cells were embryonic in character and where they invaded the connective tissue stroma in a lawless cancer-like manner. Finally, small islands of very young epithelial cells, which were usually cross-sections of the base of incomplete crypts and which probably arose from a nucleus of a few cells taken from the base of normal glands at the time of operation were also observed at the site of anastomosis." Mall⁷ states that "it is quite characteristic of epithelial cells to grow somewhat profusely in the neighborhood of wounds. In the alimentary canal and skin these newly formed cells often grow into depth, probably only to be destroyed when the equilibrium is again brought about."

The inspection of appendicectomy scars in human beings and the histologic study of the results of intestinal repairs and anastomoses in the lower animals demonstrates the remarkable manner in which healing results with the preservation of the normal relation between the mucosa of the viscus and its wall. This occurs irrespective of the type of operation or the part of the intestinal tract involved. When intestinal mucosa was found extending into the wall of the intestine of the lower animals it was shown that it was usually due to the filling or lining of breaks in the wall of the intestine, arising from faulty technic and rarely from the actual invasion of the intestine by the mucosa. When epithelium is transplanted in the immediate operative wound and lives, its life may be temporary, at least it apparently is of no clinical significance.

The repair of salpingectomy wounds is one exception to the law of normal healing of hollow viscera as has been already stated. In a very large percentage of these cases the growth of tubal epithelium, initiated by operative injury, not only actually invades the tubal stump and sometimes any structure adherent to it but it also may continue to grow after healing has occurred. Seedlings are also sometimes found in situations where bits of tubal mucosa might have been misplaced (transplanted) at the original operation.

The results of a histologic study of tubal stumps following salpingectomy or tubal sterilization in thirty-six patients were described by

the writer's two years ago. Misplaced müllerian mucosa occurring either as "sprouts" from the mucosa of the stump, as "seedlings" or both, were found in thirty of the thirty-six cases. During the last two years we have collected and studied stumps from sixty-four additional patients and have adopted methods in their study which have been of great help to us. It is the purpose of the present paper to review these hundred cases, to emphasize again the frequency of postsalpingectomy endometriosis (endosalpingiosis) and its scientific and clinical importance with the hope that others may be prompted to study the conditions resulting from the healing of salpingectomy wounds. In this way we should learn more about the origin of ectopic müllerian

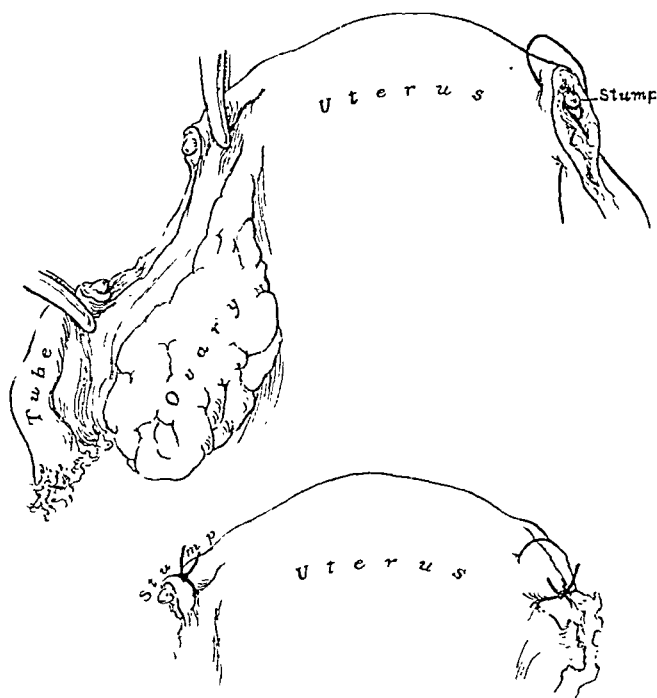


Fig. 1.—The two usual types of salpingectomy ($\times 2/3$). Many operators sever the tube distal to the uterus, often between two clamps, and ligate the stump without burying it. Others (as is our practice) remove the tube close to the uterus or excise a wedge-shaped piece of the uterine cornu and bury the stump in the cornu. In the healing of salpingectomy wounds of the first group we must account for the "nubbin" of the tube distal to the ligature and also for the behavior of the tube traumatized by the ligature and possibly crushed by a clamp. In the second group we must study the reaction of the traumatized and buried interstitial portion of the tube in the uterine cornu.

mucosa and be able to employ better judgment and technic in operations requiring salpingectomy or tubal sterilization.

In the repair of salpingectomy wounds, the mucosa of the tube, its wall and the tissue in which the stump is buried (if the latter technic is employed) all take part in this process. We must determine the fate of the tubal mucosa which is always traumatized and sometimes misplaced (transplanted) in these operations. To do this intelligently we should know the type and technic of the salpingectomy. This is

often difficult to obtain. The conditions found at the second operation will usually indicate whether or not the tube was severed distal to the uterus but further details may be lacking. In this type of salpingectomy the stump is ligated and often clamped prior to the application of the ligature. We must account for the "nubbin" of the tube distal to the ligature and the fate of the tubal mucosa in this "nubbin." One must also account for the behavior of the tubal epithelium traumatized by the ligature and possibly crushed by a clamp. Should the stump be buried in the uterine cornu, the interstitial portion of the tube is not only traumatized by severing it but it may also



Fig. 2.—Photomicrograph (X10) of a longitudinal section of a tubal stump showing normal healing. The "nubbin" of the tube, distal to the ligature (see Fig. 1) apparently has sloughed away and has been absorbed. The end of the stump (to the left) is closed by the tissues of its wall growing over the lumen without the presence of ectopic tubal mucosa either in the stump or in other structures of the salpingectomy wound. Normal healing is the exception, less than 24 per cent in 147 stumps. Both tubes and one ovary had been removed for bilateral salpingitis, nine years before the last operation. Indications for the latter were pain (pelvic adhesions) and profuse menstruation.

be injured by sutures compressing it and passing through it (Fig. 1). Even in attempted excision of the interstitial portion of the tube, the latter may not be entirely removed. In all of these operations bits of tubal mucosa may sometimes be misplaced (transplanted) in immediate or remote operative wounds. What happens to the traumatized and misplaced tubal epithelium? Some of it undoubtedly is destroyed by the operation but that which is not, as well as the near-by untraumatized epithelium, must take part in the process of repair.

What constitutes normal healing of a salpingectomy wound? Obviously a tubal stump, the end of which is closed by the tissues of its wall growing over its lumen and without the presence of ectopic tubal mucosa either in the stump or in other structures of the salpingectomy wound (Fig. 2).

In studying the results of the repair of salpingectomy wounds we must bear in mind that ectopic müllerian mucosa, from various sources,

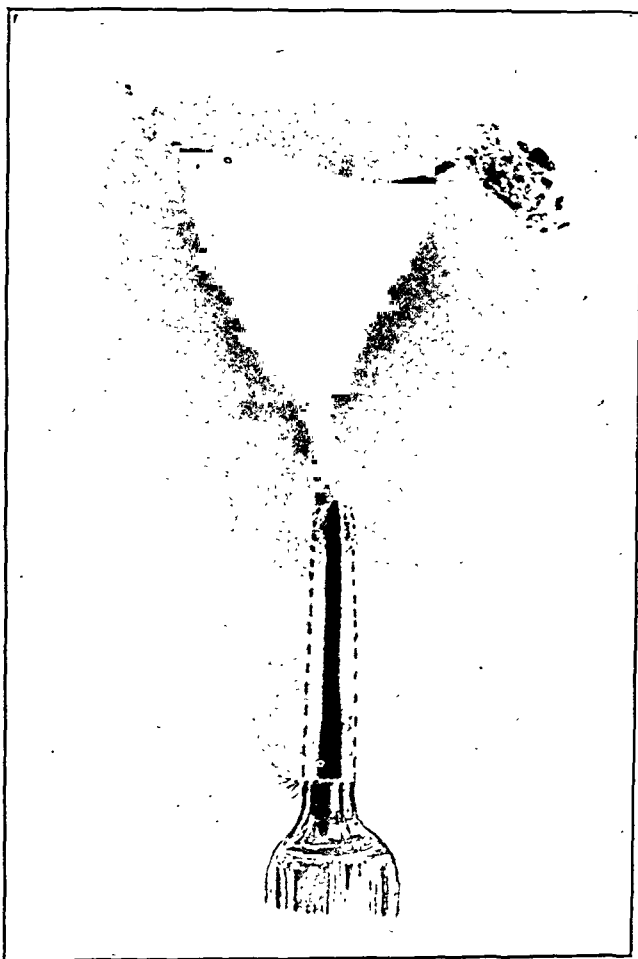


Fig. 3.—Roentgenogram ($\times 1$) of a uterus with endosalpingiosis of both uterine cornua (of nonoperative origin). The uterine cavity is filled with gelatin containing bismuth sub-carbonate which has escaped into the lumina of the tubules of the endosalpingiosis of the uterine cornua (more extensive on one side). The syringe inserted in the cervical canal indicates this method of studying endosalpingiosis both of intact tubes and also of tubal stumps.

occasionally is present in the uterine cornu and isthmus of the tube of patients who had not had a previous operation, and that this might have been present at the time of the salpingectomy. This was considered by the writer in the first series of cases reported by him.

In the discussion of this paper Novak⁹ stated that he could duplicate practically all of the conditions presented by me from sections of the

interstitial portions of tubes which had not been removed but which were still attached to the uterus and emphasized the importance of studies of the interstitial portions of normal and inflamed tubes before drawing any conclusions as to the changes which I had described following salpingectomy. Everett¹⁰ confirmed Novak's observations. I had been studying misplaced müllerian mucosa in the uterine cornu and in the tubal wall for several years, and had been impressed with its relative infrequency as compared with that found in and about salpingectomy stumps. However, this condition had not been studied with the same care as salpingectomy stumps.



Fig. 4.—Photomicrograph (X10) of a section of the uterine cornu, with the more extensive endosalpingiosis shown in Fig. 3. The interstitial portion of the tube appears in cross-section with a tubule arising from it and branches of the latter spreading out into the tissues of the uterine cornu (see arrows). Note that the tubules have extended almost to the peritoneal surface. The misplaced müllerian mucosa is everywhere of tubal type. In my experience endosalpingiosis of nonoperative origin very rarely presents the typical histologic structure of the uterine mucosa (compare with Figs. 13 and 14). Some of the tubules are empty and in others the injection mass is shrunken. Unfortunately, in handling the sections, the shrunken injection mass often drops out of the lumina of some of the tubules.

This last year, therefore, I made a careful study of the uterine cornu and the first part of the isthmus of the tube in 100 of 104 consecutive uteri from patients who had not had a previous operation. Four of the uteri were preserved as museum specimens and were not utilized.

Hoehne¹¹ in 1905 demonstrated, by the injection of gelatin containing Berlin blue, the connection between the lumen of the tube and the

branching intramural tubules present in nonoperative endosalpingiosis. The lumen of the tube was injected by a syringe inserted in its ampulla. I employed the same principal as Hoehne but with a different technic. The uterine cavity was injected through the cervix with gelatin containing a pigment (Fig. 3). Bismuth subcarbonate, graphite, lamp black and ultra-marine blue were used. They were all satisfactory except graphite. The latter gave good injections but dulled the microtome knife. After injecting the uterine cavity and forcing the mass into the lumen of the tubes, the syringe was withdrawn, cervix clamped, and the uterus placed in ice water until the gelatin had become solidified. The uterine cornu and the first part of the isthmus of the tube were excised, hardened in formalin and completely sectioned. Misplaced müllerian mucosa was found in thirteen



Fig. 5.—Photomicrograph ($\times 10$) of a longitudinal section of the interstitial portion of a tube showing a very early endosalpingiosis of nonoperative origin. The tube is patent as were those shown in Fig. 3. In order to fill the tubules of a non-operative endosalpingiosis with the injection mass, it is often necessary to clamp or ligate the tube distal to the uterus. Otherwise the mass will all escape through the lumen of the tube if the latter is patent as it often is in this condition.

of the one hundred cases. Two were associated with a peritoneal endometriosis which had invaded the uterine cornu from its peritoneal surface: these were of endometrial type. In two instances the uterine cornu had been invaded by the mucosa of the uterine cavity, which also was of endometrial type. In eight cases the uterine cornu had been invaded by the mucosa of the interstitial portion of the tube. These were all of tubal type (Figs. 4, 5 and 6) as well as the one instance of endosalpingiosis of the isthmus of the tube. Of the thirteen cases only three were bilateral, thus making sixteen instances of misplaced müllerian mucosa in two hundred uterine cornua. Eighteen of the one hundred patients showed gross evidence of an existing or previous salpingitis, four of the nine instances of primary endosal-

pingiosis occurred in this group, thus emphasizing the importance of infection as a cause of this condition. The uterine cornua were studied from thirty-two additional uteri with gross evidence of tubal infection. In the fifty cases of this group a primary endosalpingiosis was found in fourteen. Five of these were bilateral, thus making nineteen instances of misplaced müllerian mucosa in one hundred uterine cornua associated with tubes presenting gross evidence of an existing or previous infection.



Fig. 6.—Photomicrograph (X6) of a section of a uterine cornu in a plane corresponding to a cross-section of the uterus; uterine cavity injected with gelatin containing lampblack. Both tubes and one ovary had been removed, a year before, for "salp.ngitis." The tube apparently had been severed close to the uterus, and possibly its stump was buried. The interstitial portion of the tube appears in longitudinal section. A similar endosalpingiosis was present in the opposite uterine cornu. Circumstantial evidence indicates that endosalpingiosis was present in both uterine cornua at the first operation. The distal portion of this might have been of operative origin. Note the lymph vessel with müllerian tissue apparently implanted on its wall (see Fig. 7). The indications for the second operation were pelvic pain and slight uterine bleeding. Many adhesions were found at that operation and evident metastases of cancer in the pelvic lymph nodes. On incising the uterus, after its removal, a small cancer of the cervical mucosa was found. Had the uterus been removed at the first operation the second would not have been necessary, and possibly the patient's life might have been spared.

A REVIEW OF THE RESULTS OF THE HEALING OF SALPINGECTOMY WOUNDS IN ONE HUNDRED PATIENTS (INCLUDING THE THIRTY-SIX PREVIOUSLY REPORTED)

I have been studying tubal stumps for about four years. Four specimens were from autopsies (courtesy of Dr. V. C. Jacobsen) and the

remaining, either uteri or the excised stumps, were obtained at operation by members of the gynecological staff of the Albany Hospital. As bilateral salpingectomy or tubal sterilization had been done in forty-seven of the patients, one hundred and forty-seven stumps, many with other structures adherent to them, were available for histologic study.

In all instances the stump including any structure adherent to the same was completely sectioned and studied. The blocks were embedded in celloidin and the sections stained in hematoxylin and eosin. The entire course of the lumen of the tube in the stump was followed and its relation to any misplaced müllerian mucosa was determined.

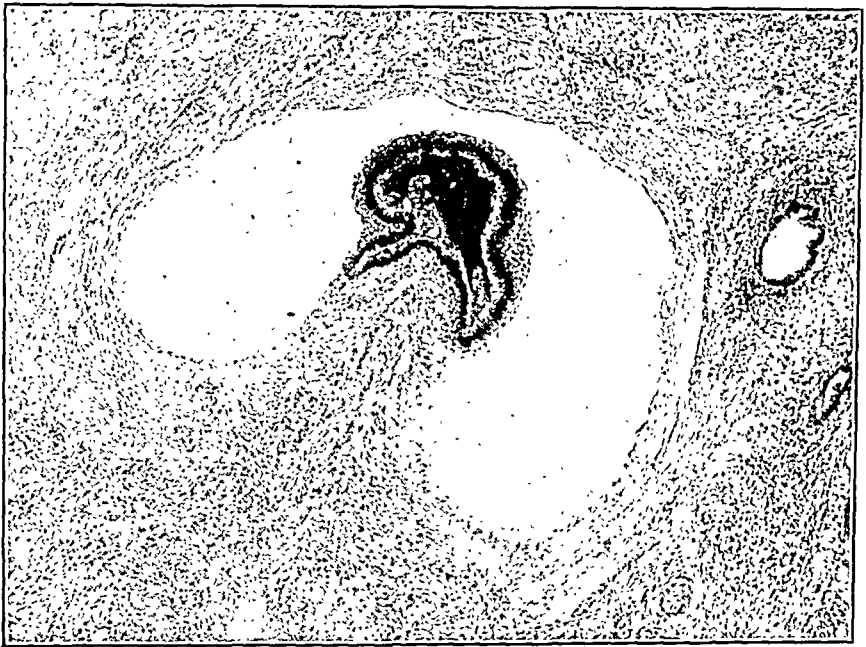


Fig. 7.—Photomicrograph ($\times 60$) of the lymph vessel shown in Fig. 6. The müllerian tissue, apparently of metastatic origin, is in reality a cross-section of a tubule, the lumen of which is filled with the injection mass. This mass had been introduced into the uterine cavity through the cervix. Serial sections of this portion of the block also demonstrated the origin of the tubule from the portion of the tube above it. The origin and course of injected tubules can be followed as readily as the course and branches of an injected blood vessel.

By carefully watching the surface of the block, as the sections were cut, one could see the tube follow its course, detect any misplaced müllerian mucosa, if present, and usually determine its relation to the mucosa of the tube. The effect was that of watching a slowly moving motion picture. The interesting sections were stacked in their sequence and stained and mounted. In places, where there was doubt as to the condition present, complete serial sections were saved and mounted. All other sections were saved until the specimen had been completely studied. In forty-three instances the uterine cavities were injected with gelatin containing a pigment as in the study of the one

hundred uteri with intact tubes. We found that this was of great assistance. The origin of any sprouts and their course was traced as readily as the course and branches of an injected blood vessel and with greater ease and accuracy than in the noninjected specimens. This feature of the work was entrusted to Miss Isabel Peck, who is well trained in histologic technic and in the diagnosis of müllerian tissue.

Normal healing, i.e., occlusion of the distal end of the tubal stump without the presence of ectopic müllerian mucosa occurred in only thirty-five of the one hundred and forty-seven stumps studied. Mis-

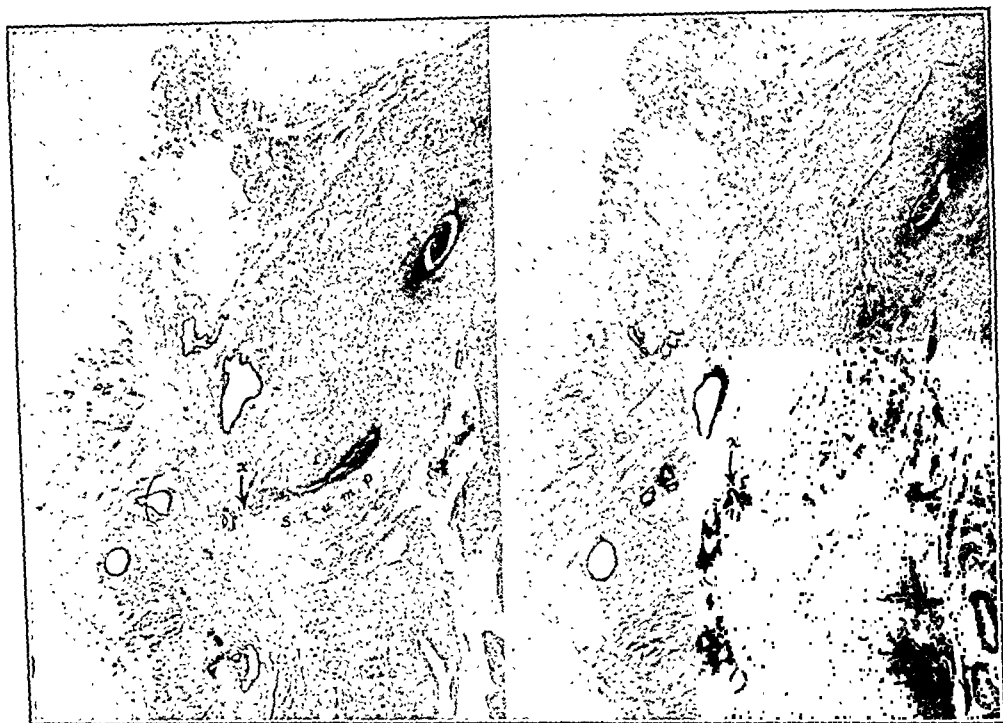


Fig. 8.—Two photomicrographs (X6) from a series of longitudinal sections of a tubal stump; uterine cavity not injected. At the first operation a year before, tubal sterilization had been done and the uterus fixed to the abdominal wall. Indications for the second operation were a sense of lack of support and severe menstrual pain. The uterus was retroflexed and pelvic floor relaxed. At operation, the appendix, uterus and left tube and ovary were removed and pelvic floor repaired. From conditions found at this last operation, evidently a piece of the tube had been excised at the first operation. Sprouts (terminal) have arisen from the outgrowth of tubal mucosa from the end of the stump. Had the uterine cavity been injected the origin of the misplaced müllerian mucosa about the stump could have been more accurately determined.

placed müllerian mucosa was found in one hundred and twelve of the one hundred and forty-seven stumps as compared with sixteen instances in two hundred controls from uteri with intact tubes and nineteen instances in one hundred controls from uteri with gross evidence of salpingitis. The distal end of the stump was proved to be patent in only three instances.

This ectopic mucosa in and about stumps falls into two groups: first, sprouts which arise from a direct outgrowth of the mucosa of the stump, and second, seedlings which are not continuous with the tubal mucosa. The sprouts are of two kinds, terminal, arising from the distal end of the stump, and lateral, growing out from the side of the stump.

The sprouts must have arisen either during the repair of the stump traumatized by the operation or independent of it. If independent, they might have been present at the time of the salpingectomy or developed after healing had occurred. Is it possible to determine, from the histologic study of the stump whether or not the endosalpingiosis,

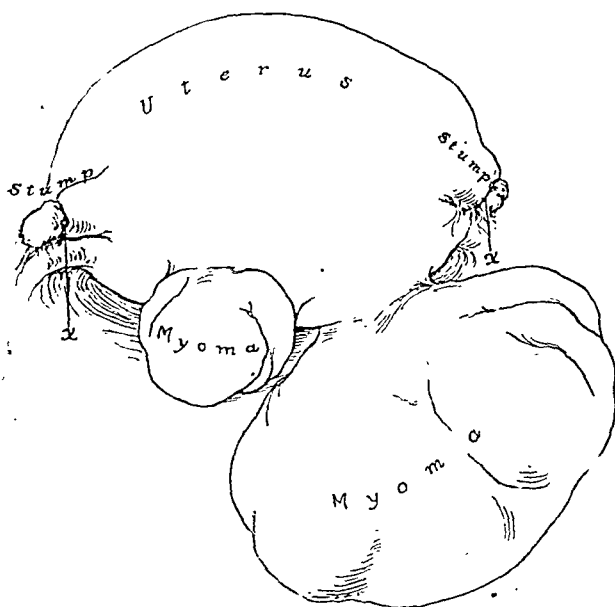


Fig. 9.—Fundus of the uterus with multiple myomata ($\times 2/3$). Both tubes had been removed eighteen years before for "salpingitis." At the last operation, by Dr. Lyle A. Sutton, the appendix, uterus and left ovary were removed. The uterine cavity was injected with gelatin containing lampblack. The tubes had obviously been severed distal to the uterus at the first operation and the stumps ligated at X and X'. (See Figs. 10 and 11.)

present, was of operative origin? I believe that it is often possible. In only three of the cases in which a unilateral salpingectomy had been done at a previous operation, was an endosalpingiosis of the same type and in the same relative situation found in both uterine cornua. In these three cases, I believe that the process in the stumps was probably of nonoperative origin. When the tube is severed distal to the uterus and an endosalpingiosis is found arising from the interstitial portion of the tube it is probably of nonoperative origin. When the sprouts arise from the distal end of the stump (Fig. 8), or if lateral (Figs. 9, 10 and 11) arise in the portion of the stump which is constricted (apparent site of ligation), circumstantial evidence indicates

that these are of operative origin. In a few instances endosalpingiosis of apparently both operative and nonoperative origin were found.

In my experience endosalpingiosis of nonoperative origin is usually of tubal and not of endometrial type (Figs. 4, 5 and 6). The cross-sections of the sprouts may so closely resemble the portion of the tube from which they arise that it is often difficult to determine which is the lumen of the tube. I have seen only one instance in forty-five specimens recently studied in which the tubules arising from the tubal



Fig. 10.—Photomicrograph (X10) of a longitudinal section of the right tubal stump shown in Fig. 9. Apparently the stump had been ligated at X, and the "nubbin" distal to the ligature did not slough off. Normal healing occurred at the distal end of the "nubbin" but in the attempted repair of the portion of the stump traumatized by the ligature an endosalpingiosis resulted. The injection mass can be seen in the lumina of some of the sprouts.

mucosa, presented the histologic structure of typical uterine mucosa. On the other hand, the sprouts of operative origin often take on the structure of typical uterine mucosa. This change was found in twenty stumps (Figs. 13 and 14).

The very large percentage of tubal stumps with endosalpingiosis (over 76 per cent in 147 stumps) as compared with the incidence of endosalpingiosis in intact tubes (8 per cent in 200 controls) leaves no

doubt as to the operative origin of this process in the majority of the stumps. In fourteen patients who had had tubal sterilization, endosalpingiosis was present in eleven and in all but one instance was present in both sides. When tubal sterilization is done the tubes are

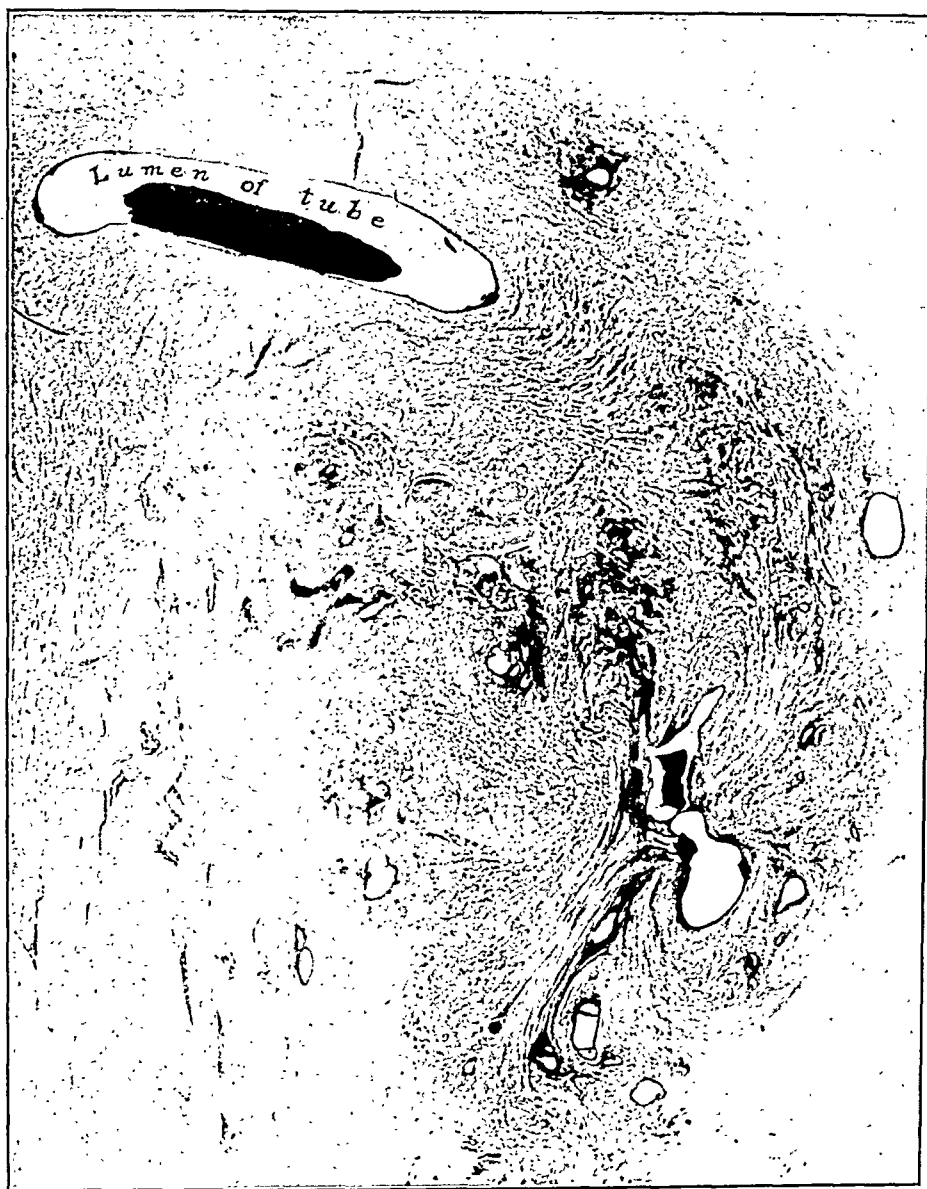


Fig. 11.—Photomicrograph ($\times 10$) of a longitudinal section of the left tubal stump in Fig. 9. An endosalpingiosis apparently has developed in the portion of the stump traumatized by the ligature.

usually normal and there is very little likelihood of an existing endosalpingiosis. In the patients with bilateral salpingectomy when endosalpingiosis was present in one stump it was also usually present in the other.

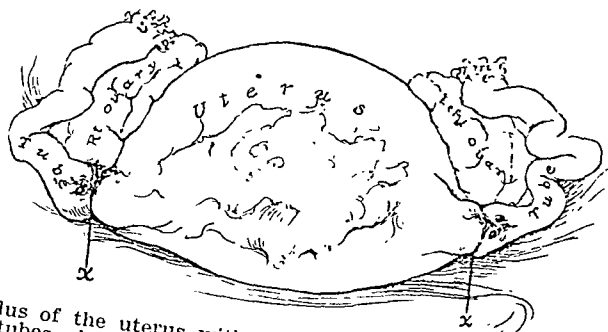


Fig. 12.—Fundus of the uterus with tubes and ovaries ($\times 2/3$); tubal sterilization by ligating the tubes close to the uterus with No. 2 chromic catgut, and ventrofixation had been done four years before the last operation. Indications for the last operation were pelvic pain and irregular uterine bleeding. Uterus and left tube and ovary were removed; uterine cavity injected with gelatin and lampblack. Constrictions evidently caused by the ligation of the tubes are indicated by X and X (see Fig. 13).

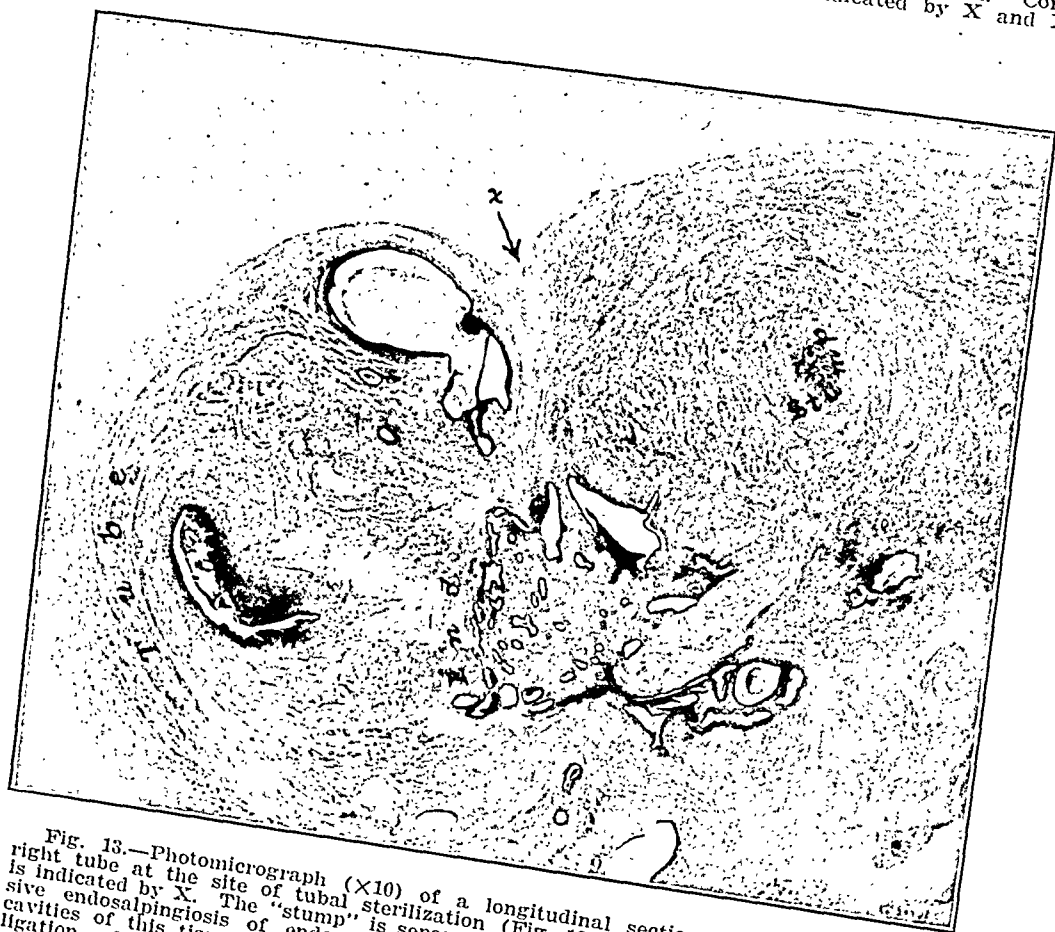


Fig. 13.—Photomicrograph ($\times 10$) of a longitudinal section of a portion of the right tube at the site of tubal sterilization (Fig. 12). The evident site of ligation is indicated by X. The "stump" is separated from the rest of the tube by an extensive endosalpingiosis of endometrial type. The injection mass escaped into the cavities of this tissue but did not reach the lumen of the tube beyond the site of ligation. Serial sections, aided by the injection demonstrated the origin of this endometrial tissue from a sprout of the tubal mucosa arising from the tubal stump.

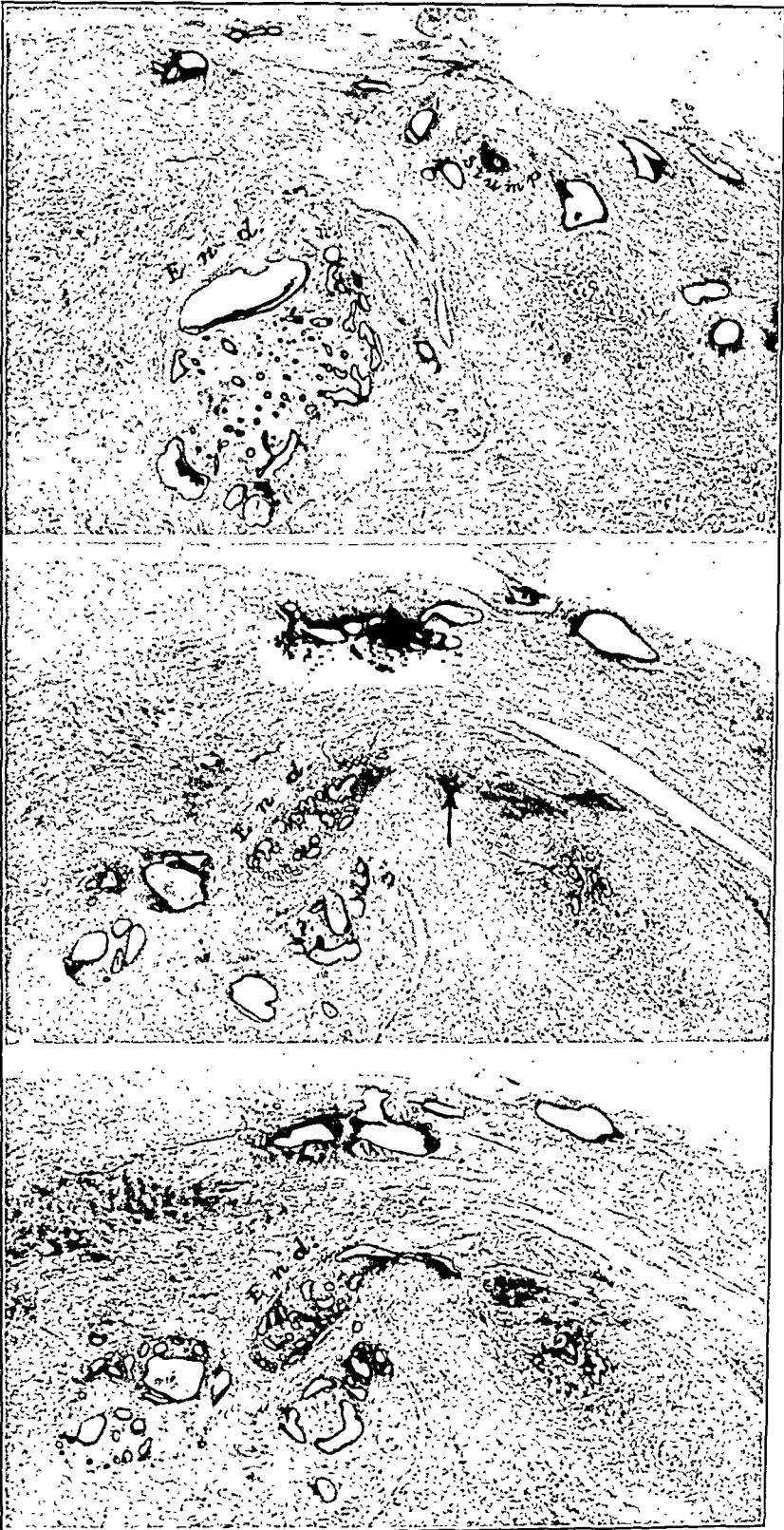


Fig. 14.

The origin of the seedlings, which have a histologic structure identical with that of the sprouts, can never be proved. Some undoubtedly are of nonoperative origin as in patients with a preexisting peritoneal endometriosis. Others, I am convinced, arise from the operation. If they spring from the tubal mucosa the seedlings must come either from the growth of tubal epithelium transplanted in the field of operation, or some of the near-by ones may originally have been sprouts whose connection with the tubal mucosa was "choked off" by the reaction and growth of the surrounding tissue.

From the histologic study of tubal stumps we may draw the following conclusions as to the fate of the tubal mucosa traumatized during salpingectomy and tubal sterilization and the part it plays in the etiology of the misplaced müllerian mucosa so often found in and about these stumps.

1. The "nubbin" of the tube, distal to the ligature applied about the stump, sometimes sloughs away and is absorbed. In other instances it is severed from the tube and lives with or without the development of endosalpingiosis in its wall. Circumstantial evidence (the stump with a stricture situated where the ligature is usually placed) indicates that the entire "nubbin" or the greater portion of it often lives and remains attached to the rest of the stump (Figs. 8, 9 and 10). Endosalpingiosis is apt to arise either in the "nubbin" itself or in the stump proximal to the situation of the ligature. Very often it apparently arises from the tubal mucosa traumatized by the ligature. Endosalpingiosis in a stump proximal to the apparent site of the ligature may have been present at the time of the salpingectomy or have arisen from the repair following the application of a clamp to the stump during the operation.

2. Endosalpingiosis in the uterine cornu of patients who have had a tube removed at a previous operation may or may not be of operative origin. When it arises from the direct outgrowth of tubal mucosa from the end of the severed interstitial portion of the tube it is of

Fig. 14.—Three photomicrographs (X8) from a series of sections of the left uterine cornu. A left suspension of the uterus and appendicectomy was done March 1929 for an adherent retroflexed uterus with endometriosis of the left ovary and culdesac in a patient greatly desiring to have children. The patient had twins a year later and was very badly torn in childbirth. Indications for the second operation were endometriosis and the injuries of childbirth. At the second operation, the peritoneal endometriosis was found to be much more extensive than at the first operation. The uterus, right tube and ovary were removed. The floor repaired. The uterine cavity was injected with gelatin and lampblack. In the upper photomicrograph, the end of the buried tubal stump can be seen containing lampblack with misplaced müllerian tissue about it. To the left and below the stump is a mass of typical endometrial tissue, the cavities of which also contain lampblack. By serial sections and with the aid of the injection mass it was found that a terminal sprout in the form of a small tubule (see arrow of the middle photomicrograph) had arisen from the mucosa of the stump and "expanded" (see lower photomicrograph) into the müllerian mucosa on both sides of it. Some of the injection mass, introduced into the uterine cavity through the cervix, escaped through the lumen of the tubal stump, thence through the sprout into the cavities of some of the misplaced endometrial tissue in the wall of the uterine cornu. The epithelium of the sprout was derived from that of the tube, and the epithelium lining the cavities of the misplaced endometrial tissue (indicated by End) was continuous with that of the sprout.

What was the origin of this ectopic endometrial tissue in the uterine cornu? I believe that it arose from a sprout of tubal mucosa.

operative origin (Fig. 14). When it arises from the interstitial portion of the tube, proximal to the end of the stump, it may be either of operative or nonoperative origin.

In the majority of the cases the endosalpingiosis is confined to the tubal stump or, if it extends beyond the same, it invades the tissues of the broad ligament or the uterine cornu depending upon the type of salpingectomy. In other instances it invades other structures which become adherent to the stump. The latter constitutes the most interesting and important group.

In six cases some portion of the intestinal tract became adherent to the stump and was invaded by sprouts arising in the stump. In two

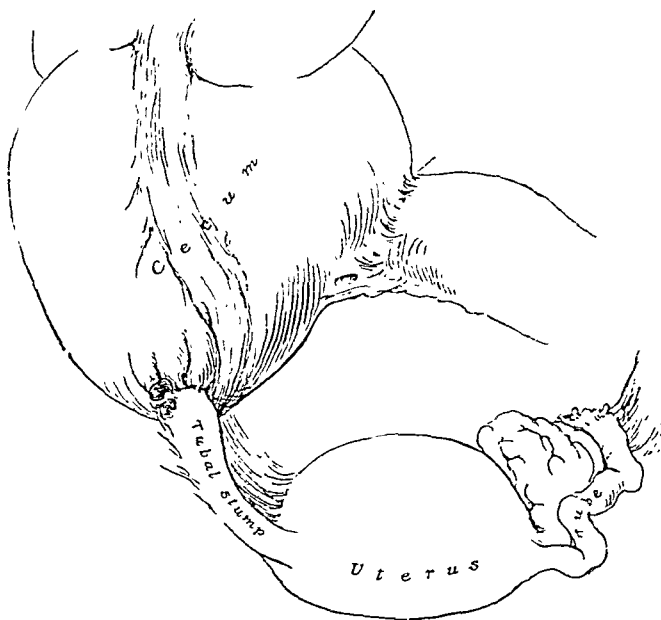


Fig. 15.—Uterus with tubal stump adherent to the head of the cecum ($\times 2/3$); endosalpingiosis of the tubal stump and of the wall of cecum. Twenty-two years before the last operation the appendix and right tube and ovary had been removed for a "pus appendix." The indication for the last operation was an extensive post-operative hernia. On opening the abdominal cavity the stump of the tube was found adherent to the head of the cecum lateral to one of its longitudinal bands and therefore not at the appendicectomy scar. Both the end of the stump and the adherent wall of the cecum were indurated and nodular presenting the gross picture of an endosalpingiosis. The tubal stump with a small "shaving" of the thickened wall of the cecum (Fig. 16) were removed and the hernia repaired.

of these the cecum was adherent to the stump of the right tube causing an evident endosalpingiosis of its wall, which was definitely proved by histologic examination in each case (Figs. 15, 16, 17 and 18). In two others the sigmoid was adherent to the stump of the left tube with gross evidence of endosalpingiosis in its wall—not proved by microscopic examination. In two additional cases the omentum was adherent to the uterine cornu and it was invaded by tubules from the tubal stump.

In four cases an ovary was invaded by sprouts from a tubal stump causing an endosalpingiosis of that organ with the development of an "endometrial" hematoma or cyst. Three of these cases were reported in the first and the other in this paper (Case 1, see Figs. 19, 20, 21 and 22).

In three cases an endosalpingiosis was present in the abdominal wall following ventrofixation of the uterus with tubal sterilization. Two of these were reported in the first communication and the other in this paper (Case 2, see Figs. 23, 24 and 25). The endosalpingiosis in all three was shown to have arisen from sprouts invading the abdominal wall from the tubal stump.



Fig. 16.—Photomicrograph ($\times 10$) of a longitudinal section of a portion of the tubal stump showing an endosalpingiosis of the end of the stump with direct extension of its tubules (sprouts) into the wall of the cecum.

Of even greater clinical importance were two ectopic pregnancies, one of which apparently developed in a sprout about the site of an attempted tubal sterilization and the other in the interstitial portion of the tube following salpingectomy with burial of the stump in the uterine cornu. The original operation was done by me in both cases.

In several instances slight peritoneal "endometriosis" was present about the site of the salpingectomy or tubal sterilization. In eight patients an extensive peritoneal endometriosis was present. It is difficult to determine the etiology of the endometriosis in this latter group. In some it was undoubtedly present at the original operation. In others it might have been of operative origin.

A detailed report of two of the more interesting cases follows.

CASE 1.—Hemorrhagic cyst of the left ovary with peritoneal endometriosis (the cavity of the ovarian cyst communicated with the lumen of the tubal stump through a terminal sprout of the latter), following resection of the tubes for "fibrosus nodosum" and attempted tubal or tubo-uterine anastomosis. Patient aged 45 (no children, possible miscarriage four years ago) was operated upon March 15, 1910, for sterility. The uterus was retroverted and both tubes were occluded near the uterus by a nodule designated in the operation report as "fibrosus nodosum." According to the description of the operation the "horns of uterus were incised, part of each tube containing fibroid incised down to part of good lumen in tubes and sutured to incised uterus." The uterus was suspended, kidney fixed, appendix not removed. It was difficult to reconcile the description of the first operation with the findings at the last. I wrote to the surgeon who performed the first operation, sending him a copy of the hospital record of his operation and my own findings. He kindly replied, stating that the nodules must have been excised and tubes implanted in the uterine cornua.

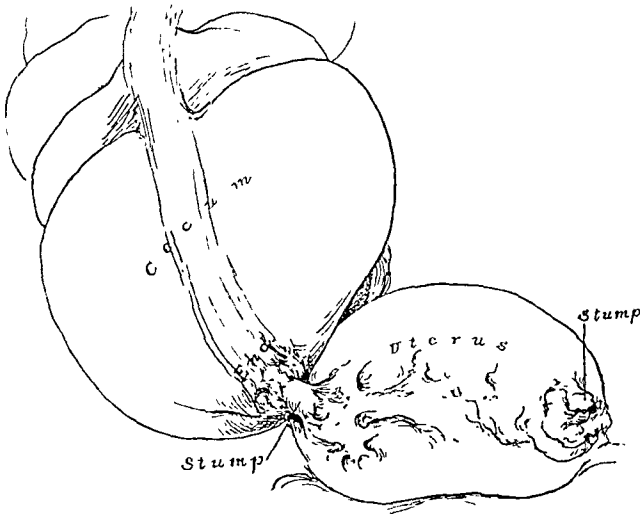


Fig. 17.—Uterus with tubal stump adherent to the head of the cecum ($\times 2/3$); endosalpingiosis of the stump and of the wall of the cecum. Ten years before the last operation, both tubes were removed for "salpingitis." The indication for the second operation was pelvic pain. The stump of the right tube was adherent to the head of the cecum possibly at the site of the appendicectomy. The cecum was indurated and nodular at this place, presenting the gross appearance of an endosalpingiosis. The stump was severed close to the cecum; the uterus and right ovary were removed. A small "shaving" of the thickened wall of the cecum was later excised without exposing its mucosa. The uterine cavity was injected with gelatin and lampblack; the mass escaped through the ends of both tubal stumps.

I first saw the patient November 22, 1928. She complained of pain and pressure sensations in the pelvis. Menstruation was regular, normal, and without pain. The uterus was irregularly enlarged and fixed in the pelvis. A preoperative diagnosis was made of an adherent multinodular myomatous uterus. At operation, November 26, the uterus containing multiple myomata was found to be retroflexed and firmly adherent to the bottom of the posterior culdesac. The appendix was first removed. The uterus was freed with great difficulty and in doing so a hematoma of the left ovary was ruptured, a small amount of chocolate-like fluid escaping. I then noticed that the wall of the ovarian hematoma was fused with the posterior surface of the left uterine cornu. Great care was taken not to disturb this relation. The entire uterus and both tubes and ovaries were removed. Peritoneal endometriosis was present on the surfaces of the structures surrounding the left ovary, such as the posterior layer of the left broad ligament, the posterior surface

of the uterus, the left lateral surface of the rectosigmoid and the under surface of a pedunculated myoma. The myoma arose from the fundus of the uterus and, like a "lid," covered the left ovary to which it was adherent. The endometriosis was restricted to the structures just mentioned. The uterine cavity was injected with gelatine containing bismuth subcarbonate. The injection mass freely escaped through the abdominal ostium of the right tube. It did not escape through the

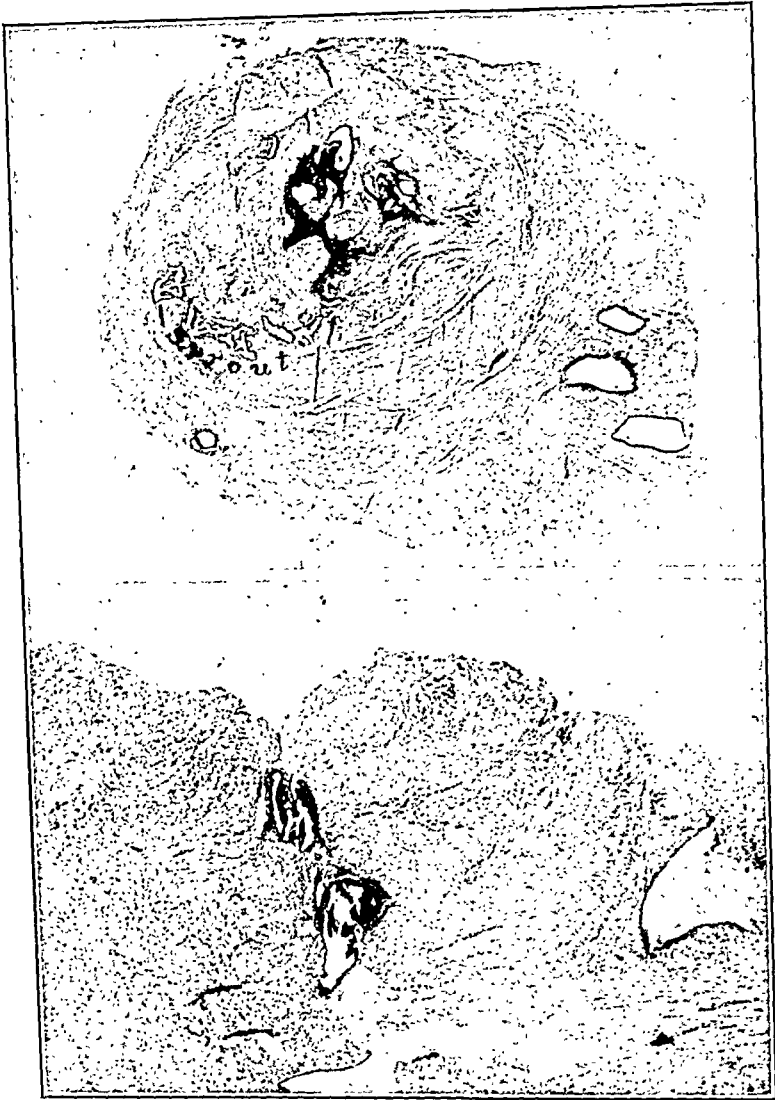


Fig. 18.—Two photomicrographs, the upper of a cross-section of the tube near its attachment to the cecum (X10) and the other (X25) of the small piece of the thickened wall of the cecum, which had been excised. Sprouts arising from the mucosa of the stump are shown in the upper photomicrograph. The invasion of the wall of the cecum by müllerian tissue of uterine type is shown in the lower. Endosalpingiosis of uterine type was present in the left tubal stump.

abdominal ostium of the left tube but passed readily into the cavity of the ovarian hematoma, the wall of which was fused with the left uterine cornu (Fig. 19). In this way we were able to demonstrate that the right tube was patent and the previous operation on this side had been successful. On the other hand, the left tube was not patent and the uterine cavity communicated with that of the ovarian

hematoma through some sort of a fistulous tract. Sections of the right uterine cornu showed that this tube was patent and I was unable to detect the site of repair. Serial sections were made, in a plane at right angles to the long axis of the uterus, of the left uterine cornu and the portion of the left ovary fused with it. We found that the end of the severed tube was not continuous with the tubal stump (Fig. 20). A sprout had arisen from the end of the latter and had invaded the ovary, thus establishing a communication between the lumen of the tubal stump and the cavity of the ovarian hematoma and permitting the injection mass to escape from the uterine cavity into that of the hematoma (Figs. 19, 20, and 21). The epithelial lining of the sprout arose from that of the tube and the epithelial lining of the ovarian hematoma about the opening of the sprout was continuous with that of the latter. Typical endometrial tissue was not found in the lining of the

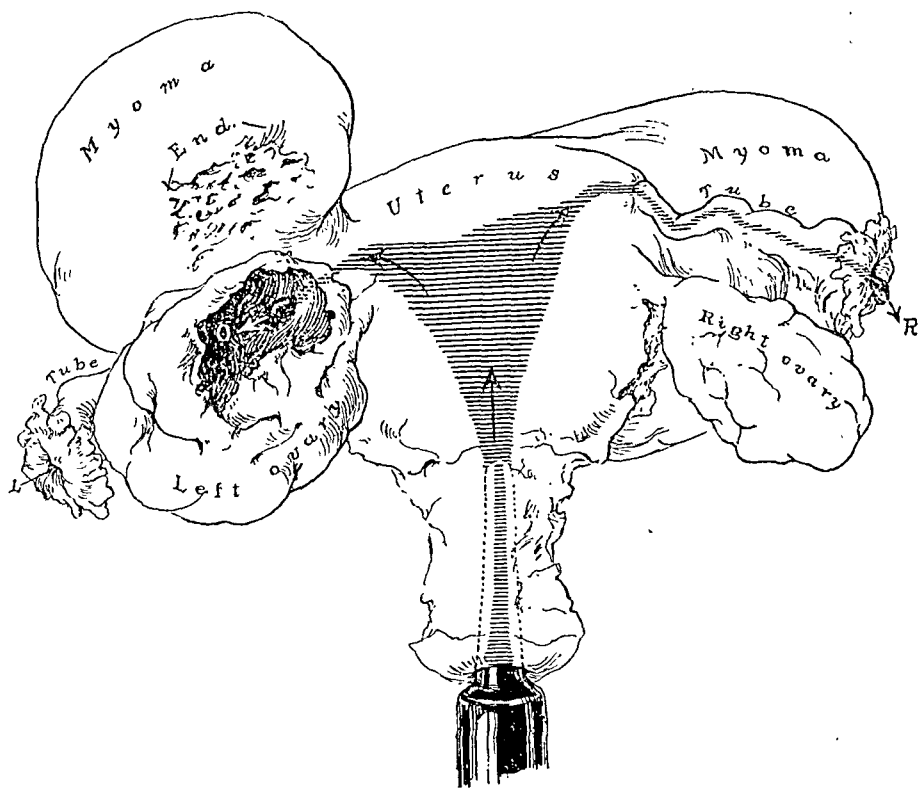


Fig. 19.—Posterior view ($\times 2/3$) of the uterus, tubes and ovaries (case 1). Hemorrhagic cyst of the left ovary with peritoneal endometriosis (cavity of cyst communicating with the lumen of the left tubal stump through a terminal sprout of the latter), following resection of the tubes and attempted tubal or tubouterine anastomosis (see case report). Peritoneal endometriosis was restricted to the structures surrounding the left ovary. In freeing the latter the wall of a hemorrhagic cyst was ruptured and its chocolate-like contents escaped. The pedunculated myoma arising from the left uterine cornu was adherent to the wall of the cyst. Endometriosis was present on this surface of the myoma. On injecting the uterine cavity, through the cervix, the mass easily escaped through the patent right tube but did not escape through the left tube. However, it passed readily into the cavity of the hemorrhagic cyst, the wall of which was fused with the left uterine cornu. (See Figs. 20 and 21).

ovarian hematoma. For the most part an epithelial layer was absent, as so often occurs in hematomas of this type. When present it was similar to that of the sprout arising from the tubal stump. This case is one of four encountered in this series in which a hematoma of the ovary was present, the epithelial lining of which was continuous with the epithelial lining of sprouts arising from a tubal stump. The other three cases were reported in the previous paper. I believe that in all



Fig. 20.—Two photomicrographs (X10) from a series of sections through the left uterine cornu with ovary adherent to it (Fig. 19). The stump of the tube with injection mass in its lumen and also the end of the tube without any of the injection mass are clearly shown in the upper photomicrograph. The lower photomicrograph shows the end of the tubal stump nearer the adherent ovary. The end of the resected tube is also shown with indications of the failure of the tubal anastomosis.

four instances the ovarian hematoma (müllerian cyst) developed from tubal epithelium which had invaded the ovary.

What was the origin of the peritoneal endometriosis which was restricted to the structures adherent to and about the left ovary? Circumstantial evidence would indicate that the ovarian hematoma had ruptured, its contents escaping and soiling the pelvic structures which surrounded it. The ovarian hematoma arose from the direct extension of tubal epithelium through the sprout from the tubal stump. Could the peritoneal endometriosis have arisen from the implantation of similar epithelium

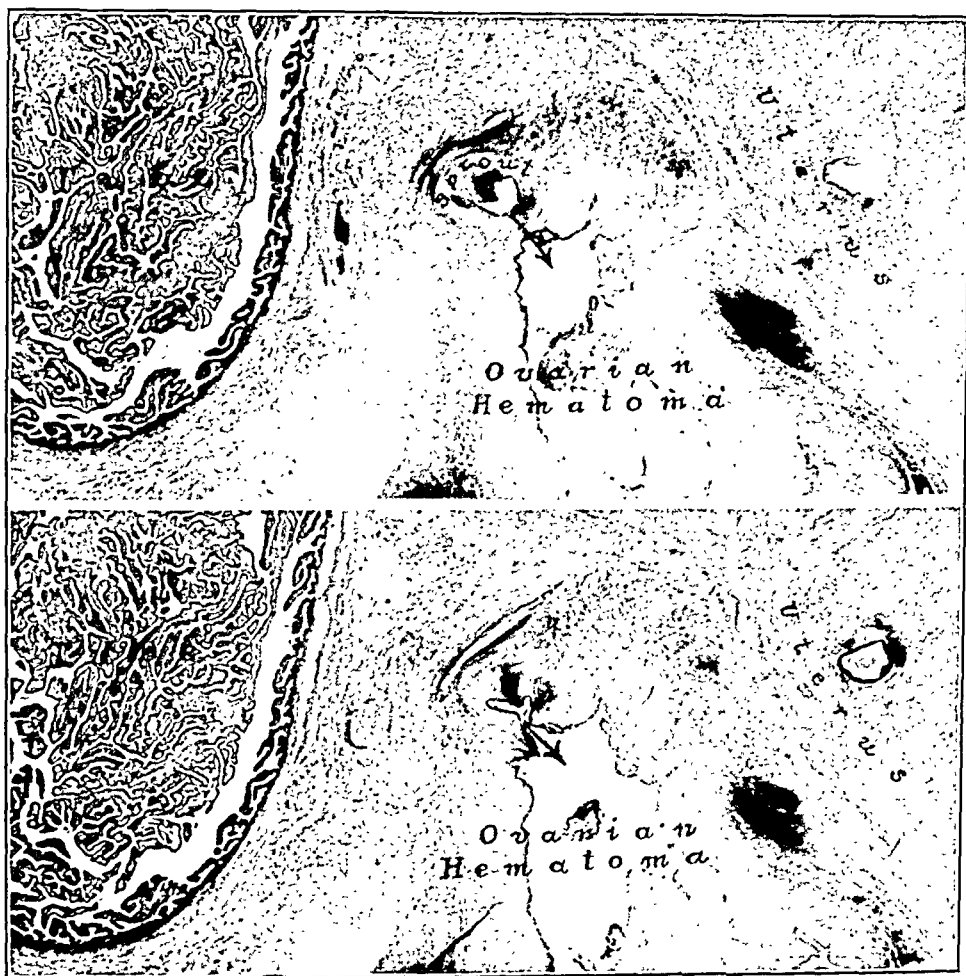


Fig. 21.—Two photomicrographs (X10) from the same series of sections shown in Fig. 20 but at lower levels. A terminal sprout from the tubal stump shown in Fig. 20 has invaded the wall of the ovarian hematoma and in the lower photomicrograph it is shown emptying into the cavity of the hematoma. By these channels the injection mass introduced into the uterine cavity, through the cervix, escaped from that cavity into the cavity of the ovarian hematoma (Fig. 19). The epithelium lining the sprout was derived from the tubal mucosa and the epithelium lining the ovarian hematoma, about the opening of the sprout, was continuous with that of the latter (compare with Fig. 14). What was the origin of the ovarian hematoma?

cast off from the lining of the ovarian hematoma and escaping in its contents at the time of rupture? The histologic structure of the peritoneal lesions (Fig. 22) were even more characteristic of müllerian mucosa than that of the lining of the ovarian hematoma.

CASE 2.—Endosalpingiosis of the abdominal wall about both uterine cornua following tubal sterilization and ventrofixation of the uterus. Patient, aged 37 (two children), had had three operations for the cure of prolapse of the uterus. At the last operation twelve years ago both tubes and ovaries were severed from their uterine attachment and the uterus was drawn through the abdominal incision. The abdominal wall was closed about the uterus at the level of its internal os, leaving the fundus in the subcutaneous portion of the abdominal wall and the tubes and ovaries in the pelvis. She was first seen by me in November, 1928. Her chief complaint was profuse and prolonged menstruation without pain, although the uterus seemed more tender at that time. I did not see her again until September, 1929. The profuse menstruation had continued and the uterus in the abdominal wall beneath the skin annoyed her more than it had in the past and the tenderness during menstruation had increased. On September 30, 1929, the uterus was removed by a supravaginal hysterectomy, the cervix fixed in the abdominal wall, and the pelvic floor repaired. In freeing the fundus of the uterus a hard mass involving both

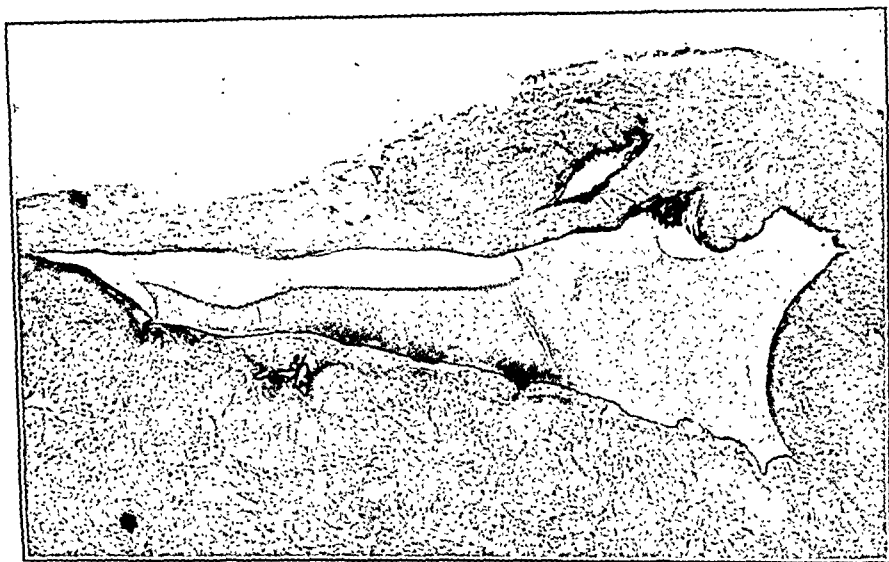


Fig. 22.—Photomicrograph (X8) of a section through the under surface of the myoma, shown in Fig. 19, which was adherent to the left ovary. A typical "endometrial" hematoma is present, occurring in a situation readily soiled by material escaping from the ovarian hematoma beneath it and with circumstantial evidence indicating that the ovarian hematoma had ruptured (see case report). What was the origin of the hematoma shown in this photomicrograph?

uterine cornua and the surrounding adipose tissue was found. These were carefully dissected from the surrounding adipose tissue and removed intact with the uterus (Fig. 23). The uterine cavity was injected with gelatin containing graphite and the specimen hardened in formalin. Sections of both uterine cornua with attached nodules were cut in planes at right angles to the long axis of the uterus. An endosalpingiosis was present in both nodules, the tubules of which had invaded the adipose tissue of the abdominal wall. As the sections of the right side were cut the injection mass was easily seen with the naked eye in the lumina of the müllerian tubules about the tubal stump. As more sections were cut one could see the injected tubules unite and "flow" into the lumen of the stump (Fig. 24). In this way the origin of the endosalpingiosis about the right uterine cornu was definitely determined—namely from sprouts of tubal mucosa in the form of tubules, invading the surrounding adipose tissue. In addition a definite seedling was present in the adipose tissue of the right side (Fig. 23).

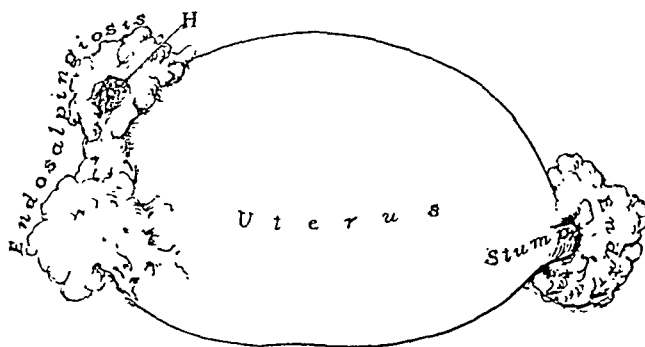


Fig. 23.—Fundus of the uterus ($\times 2/3$) with endosalpingiosis of the abdominal wall about both uterine cornua following tubal sterilization and ventrofixation of the uterus (case 2). Adipose tissue invaded by ectopic müllerian tissue is present about both uterine cornua. A seedling marked "H" is present on the right side. The uterine cavity was injected with gelatin and graphite (see Figs. 24 and 25).



Fig. 24.—Photomicrograph ($\times 10$) of one of a series of sections of the right tubal stump with the nodule adherent to it. Graphite was found in the lumina of some of the tubules of the abdominal wall beyond the stump. As more sections were cut the injected tubules united and joined the mucosa of the stump. The origin of the endosalpingiosis about this stump was definitely determined—namely from sprouts of tubal mucosa invading the surrounding adipose tissue.

On sectioning the left uterine cornu, with its attached nodule, a similar endosalpingiosis was found but without the presence of the injection mass in the lumen of any of its tubules. The end of the tubal stump was closed by "normal healing." Endosalpingiosis was present about the end of the stump (Fig. 25). Circumstantial evidence would indicate that it also must have arisen from tubal mucosa. If by sprouts, their connection with the mucosa of the stump must have been "pinched off" by the contraction of the wall of the stump. On the other hand a "nubbin" of the tubal mucosa may have been tied off at the original operation, the endosalpingiosis thus arising from the growth of this transplanted tubal mucosa.

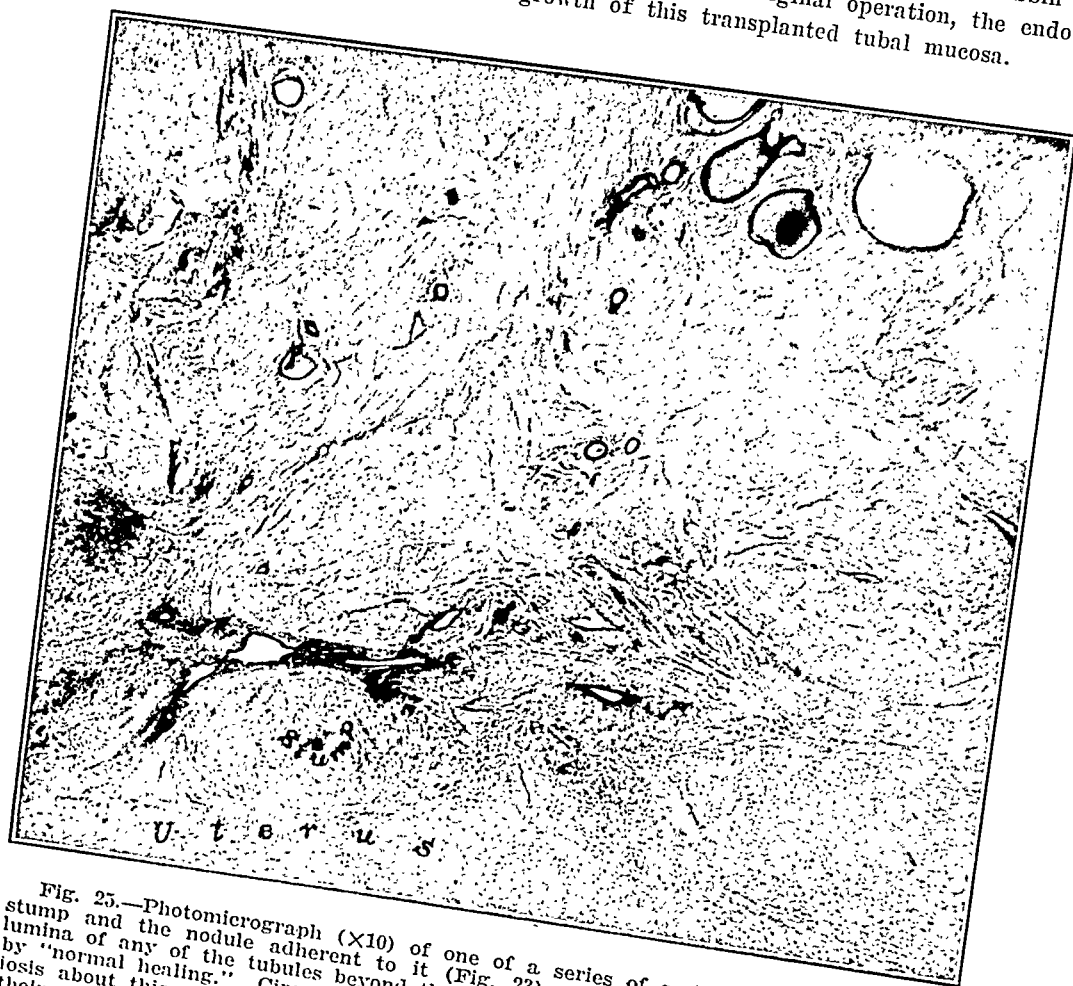


Fig. 25.—Photomicrograph (X10) of one of a series of sections of the left tubal stump and the nodule adherent to it (Fig. 23). Graphite was not found in the lumina of any of the tubules beyond the stump. The end of the stump was closed by "normal healing." Circumstantial evidence would indicate that the endosalpingiosis about this stump also might have arisen from tubal mucosa. If by sprouts, their connection with the mucosa of the stump must have been "pinched off" by the healing of the wall of the stump. On the other hand a "nubbin" of the tubal mucosa may have been tied off at the original operation, the endosalpingiosis thus arising from the growth of this transplanted tubal mucosa.

THE ETIOLOGY OF POSTSALPINGECTOMY ENDOSALPINGIOSIS

In some instances, misplaced müllerian mucosa undoubtedly was present in the uterine portion of the tubes at the time of the original operation. I doubt if its incidence was any greater in the one hundred patients who had a salpingectomy or tubal sterilization than in the

hundred control patients without a previous operation. It was present in 13 per cent of the latter. In the majority of the cases, the endosalpingiosis arose from the overactivity of tubal epithelium in the repair of the salpingectomy wound. This activity is sometimes so great that the sprouts, arising from the traumatized and stimulated mucosa of the stump, may invade the tissues in which the latter is buried or to which it becomes adherent. The type of operation and likewise its occasion apparently are of minor significance in the etiology of the endosalpingiosis as compared with the inherent tendency of tubal epithelium to become invasive when permitted to do so and when properly stimulated. It occurred in all types of salpingectomy which I have had the opportunity to study. I have never obtained a uterine cornu in which the entire interstitial portion of the tube had been excised.

The original operation took place in the gynecologic clinic of the Albany Hospital in only nineteen of the one hundred patients. It was, therefore, impossible to determine the exact technic of the salpingectomy in the majority of the others. We also had difficulty in ascertaining the condition for which the tube or tubes were removed in many patients. We do not know in just how many patients the tube or tubes were removed for salpingitis or its results. These probably constitute a large group. However, the incidence of endosalpingiosis in this group (estimated) was no greater than in patients with tubal sterilization in whom the tubes are apt to be normal. Tubal sterilization had been done in fourteen patients and in eleven of these endosalpingiosis was present, ten bilateral. Bilateral salpingectomy had been done in thirty-three patients, endosalpingiosis was present in twenty-seven and it was bilateral in twenty-one. These figures suggest that the tubal mucosa and its inherent tendency to become invasive are usually the same in both tubes of the same person, though differing in individuals. While endosalpingiosis developed in stumps in which the tube was severed distal to the uterus it appeared to be more frequent in stumps near the uterus or buried in the uterine cornu, the usual situation of endosalpingiosis of non-operative origin. Possibly the tubal mucosa in these situations "naturally" has a greater tendency to become invasive when the opportunity presents itself. A stump close to the uterus or in the uterine cornu would probably have a better blood supply than one distal to the uterus. The burial of the stump would also increase the blood supply to its tissues and enhance the growth of the tubal mucosa. The growth of tubal epithelium initiated by operative injury, would be maintained by three factors, removal of restraint (damage to tissues surrounding the mucosa and relative tardiness in its repair), preservation of blood supply and the presence of specific stimulation. For the latter we look to the ovaries. The salpingectomy had been done in

all of the patients before the menopause. Both ovaries had been removed in only two patients. Endosalpingiosis was not present in the tubal stumps (four in number) of these patients, but they are too few in number to be of any statistical value.

ENDOSALPINGIOSIS FOLLOWING TORSION OF THE TUBE

If endosalpingiosis arises in the repair of a large percentage of the tubal stumps of operative origin why should it not also occur in the repair of stumps resulting from amputation of tubes by torsion? The last three years we have been on the lookout for tubal stumps of non-operative origin and have encountered four cases.

CASE 3.—Patient aged 33 years. Operation at the Albany Hospital, September 20, 1927. The uterus was retroverted, drawn to the right with its cornu firmly adherent to the side of the pelvis. Right tube and ovary were absent, left tube and ovary appeared normal. In attempting to free the uterine cornu a structure adherent to it and resembling the ovarian vessels was severed. This proved to be the right ureter. The injury was repaired by an end-in-end anastomosis. The right uterine cornu was excised, appendix removed, and uterus suspended. The patient made an uneventful recovery. An endosalpingiosis of tubal type was present in the tubal stump. From the circumstantial evidence found at operation, it would appear that the right tube and ovary had been amputated by torsion and subsequently were absorbed.

CASE 4.—Patient aged 59 years, operation at the Albany Hospital, September 12, 1929. A cyst of the right ovary (size of a large grapefruit) was found densely adherent to the side of the pelvis, uterus and other pelvic structures. The distal portion of the right tube was absent (at least I was unable to find it). The tubal stump, club shaped and about 2.5 cm. long, was present. The uterus, ovarian cyst, opposite tube and ovary, and appendix were removed. The patient made an uneventful recovery. An endosalpingiosis of tubal type was present in the tubal stump. The uterine end of the opposite tube was normal. From circumstantial evidence, found at operation, it would appear that there had been a torsion of the pedicle of the cyst with amputation of the tube.

CASE 5.—Patient aged 42 years, operation at the Albany Hospital, December 10, 1929. A large myomatous uterus, filling the pelvis and extending into the abdominal cavity, was present. The left tube and ovary were jammed between the tumor and the pelvic brim. After ligating and cutting the left ovarian vessels the uterus was lifted out of the pelvis. I then noticed that the left tube was twisted and had been almost completely severed in its midportion. The uterus, left tube and ovary and appendix were removed. The patient made an uneventful recovery. An endosalpingiosis of tubal type was present in the traumatized portion of the left tube.

CASE 6.—Patient aged 27 years. Operation at the Albany Hospital, February 10, 1930. Multiple small myomata were present. The right ovary was absent and the greater portion of the right tube, a stump about 2 cm. long being present. There were no adhesions and the ovarian vessels of the right side could not be found. The opposite tube and ovary appeared normal. The appendix, myomata and tubal stump were removed. The patient made an uneventful recovery. Endosalpingiosis was not present in the tubal stump. The lack of adhesions and my inability to find the ovarian vessels on the right side led me to believe that the absence of the right ovary and tube might have been of congenital origin.

These cases are too few in number to enable us to determine the frequency of endosalpingiosis arising from the repair of injury to tubes following torsion. However, they suggest that the repair following torsion is similar to that following operative removal.

ENDOMETRIOSIS FOLLOWING SUBTOTAL HYSTERECTOMY AND HYSTEROTOMY

In the repair of salpingectomy wounds, tubal epithelium frequently invades the wall of the stump and at times any organ or structure becoming adherent to it. What is the behavior of the uterine epithelium in the repair of the uterine stump after subtotal hysterectomy and also in the healing of incisions through the uterine wall?

Primary endometriosis, arising from the invasion of the uterine wall by its mucosa is not of infrequent occurrence. In subtotal hysterectomy the uterus is frequently cut across above the internal os, thus leaving in the stump a portion of the body of the uterus with its endometrium. We would expect the uterine epithelium sometimes to invade the stump and any structure becoming adherent to it just as tubal epithelium invades the stump of salpingectomy wounds. I have been looking for it and have encountered only one instance. In this case the cervix was fixed in the pelvis by a tumor mass causing the patient great discomfort. The cervix and mass were removed through an abdominal incision. It proved to be an extensive endometriosis (so-called adenomyoma), arising from the mucosa of the hysterectomy stump. I wrote to the surgeon who removed the uterus and he claimed that there was no evidence of an endometriosis in the uterus removed.

If the endometrial tissue in laparotomy scars, after the incision of the pregnant uterus, develops from bits of uterine mucosa transplanted by the surgeon we should expect often to find a similar condition in the uterine scar and in near-by pelvic structures following these operations. Schwarz¹² reports that in his study of the cesarean scar of the human uterus he found endometrial tissue along the line of incision in two instances. In his experimental study of the cesarean scar in the guinea pig, endometrial tissue was found in several cases along the line of incision as well as on the peritoneal surface of the uterus. I have had the opportunity to study only two cesarean scars and one hysterectomy scar following an incision in the nonpregnant uterus. Misplaced uterine mucosa was not found in these cases. J. Whitridge Williams¹³ made the following statement to me in a recent personal communication on the healing of cesarean scars: "I have had an abundant opportunity of studying the cesarean scar. Without going into my records. I shall say that I have at least fifty such specimens. In no instance do I recall any invasion of the scar by aberrant mucosa, though in many cases a tongue of mucosa extends into the inner side of the scar. This I take it is due to imperfect suturing and not at all to any invasive property."

The frequency of aberrant mucosa in salpingectomy scars as compared with the infrequency of aberrant mucosa in cesarean scars admits of two possible interpretations, either tubal epithelium is more invasive than uterine or else pregnancy lessens the activity of the uterine epithelium.

Only four patients in this series were operated upon primarily for tubal pregnancy. Endosalpingiosis was found in only one of the four stumps. It was not present in the uterine portion of the opposite tube in this case. I have encountered four instances of tubal pregnancy in nonoperated tubes with an endosalpingiosis in the uterine portion of the tube. Therefore, I am unable to estimate the influence of pregnancy on the growth of tubal epithelium stimulated by operative injury.

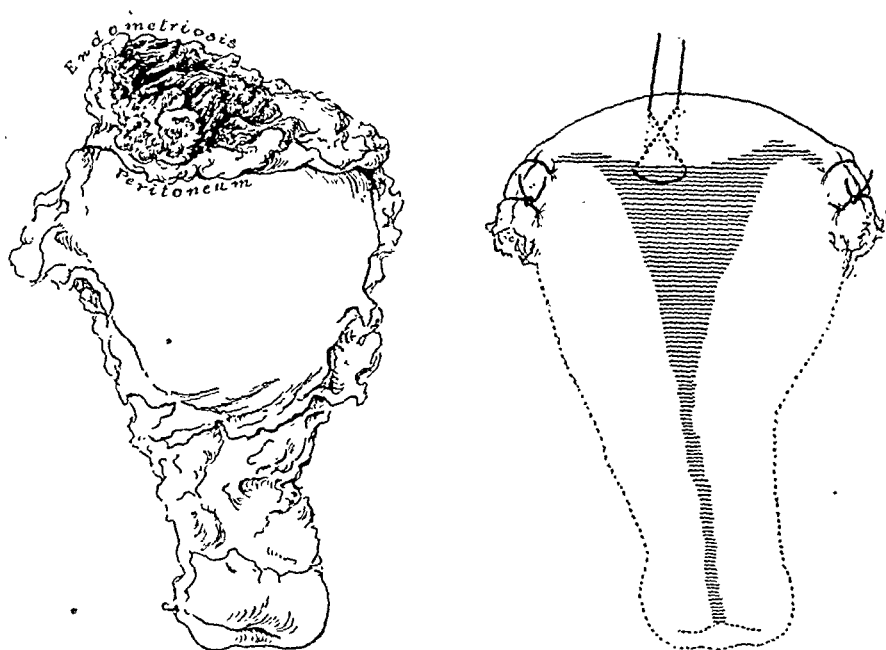


Fig. 26.—Endometriosis of the abdominal wall, from tubules arising from the uterine mucosa, following ventrofixation of the uterus. Anterior view of the uterus ($\times 2/3$) with endometrial nodule excised from the abdominal wall and attached to the fundus (case 7). Sketch to the right indicates the burial of the tubal stumps in the uterine cornua at the first operation and the figure eight traction suture of catgut, the ends of which were rethreaded and passed through the recti muscles in the closure of the abdominal incision. I believe that this traction suture must have penetrated the uterine cavity and caused a rent in the uterine wall which later was filled with the uterine mucosa (Fig. 27). Tubules arising from this uterine mucosa penetrated the wall of the uterus above the rent and invaded the abdominal wall (Fig. 28). Endosalpingiosis of tubal type arising from the buried tubal stumps was present in both uterine cornua but was only of histologic interest.

In 1929 Hosoi and Meeker¹¹ published a very comprehensive review of the subject of endometriosis and included in it an abstract of 87 cases of endometriosis of the abdominal scar which they had collected from the literature. They state that sections of the uterus in these cases where the fundus was adherent to the tumor or mass in the laparotomy scar did not show any endometrial tubules. This demonstrated "that the laparotomy tumors reported in the literature were

not due to an extension from the uterine cavity." Nicholson¹⁵ in his review of endometrial tumors of laparotomy scars also states that "the anatomic continuity between the epithelium of the uterine mucosa and that of the tumor of the abdominal wall had not been established in a single instance in the cases collected by him."

In my first paper on endosalpingiosis following salpingectomy, two cases of "endometriosis" of the abdominal wall after ventrofixation

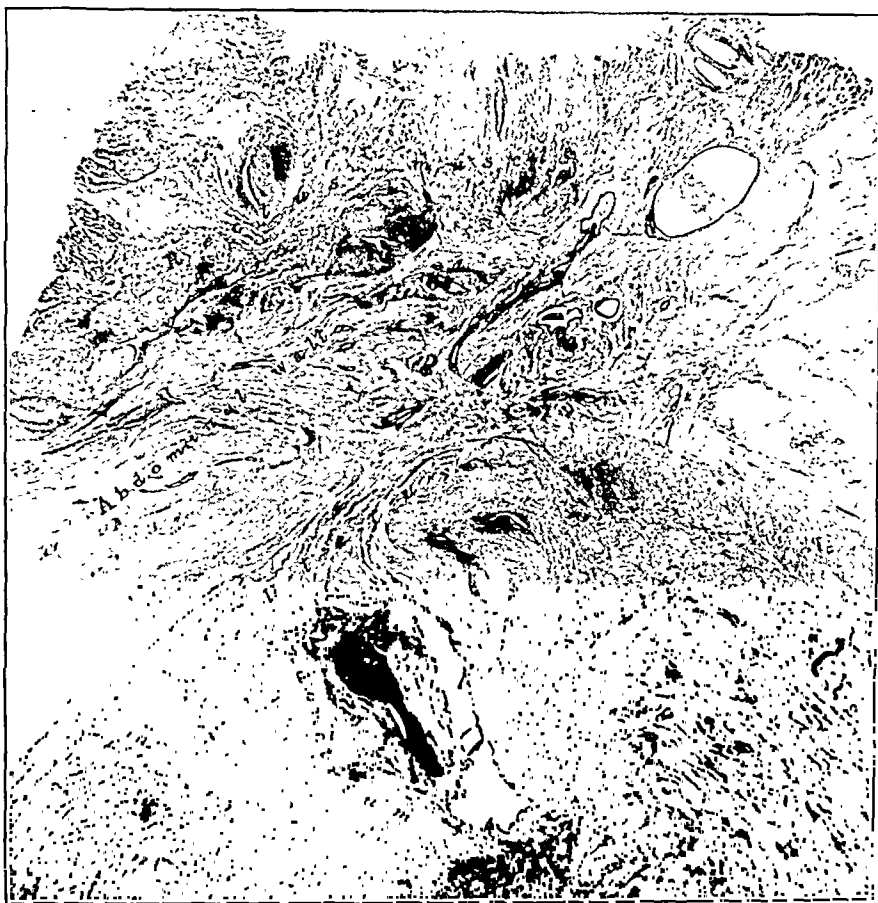


Fig. 27.—Photomicrograph (X6) of one of a series of sections of a portion of the uterine wall with attached nodule excised from the abdominal wall. The rent in the uterus probably caused by the traction suture is filled with endometrium. The portion of the abdominal wall attached to the uterus is infiltrated with tubules (Fig. 28) which have invaded the rectus muscle.

were reported in which it arose from the direct invasion by tubules from the tubal stump (tubal sterilization in one instance and salpingectomy in the other). Since then I have encountered a third case (reported in the present paper).

I have seen only one instance of endometriosis of the abdominal wall after ventrofixation in which it arose from tubules arising from the uterine mucosa.

CASE 7.—The patient aged twenty-eight (one child five years old) was first operated upon by me, November 6, 1924, for a weakened pelvic floor, and adherent retroflexed uterus due to salpingitis. The cervix was cauterized, pelvic floor repaired, appendix, left tube and ovary and right tube removed. The fundus of the uterus was fixed extraperitoneally to the abdominal wall. She was readmitted to the Albany Hospital in November, 1928, with the following history: She was well for a year after her first operation. This was followed by increasing menstrual pain which was felt both in the pelvis and in the abdominal scar. The pain began

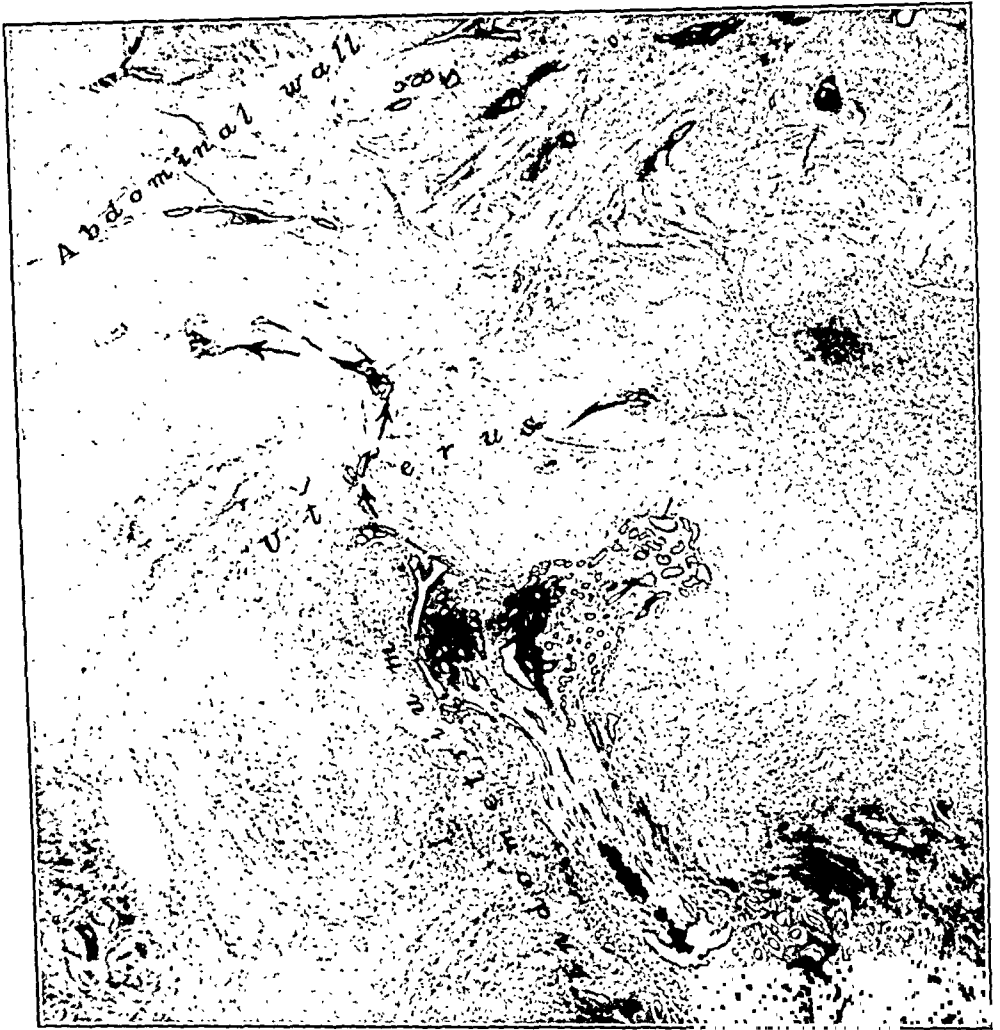


Fig. 28.—Photomicrograph (X10) of another section from the same series shown in Fig. 27. A tubule, arising from the uterine mucosa filling the rent, has invaded the uterine wall above the rent (see arrows) and extended into the abdominal wall causing the endometriosis in this situation. On account of the large amount of endometrium filling the rent, the injection mass, introduced into the uterine cavity, was unable to penetrate the tubules arising from it.

with the flow and lasted three or four days. Lately she was forced to spend the greater part of the menstrual period in bed. On pelvic examination the uterus was found to be fixed to the abdominal wall and tender on palpation. At operation, November 8, the right rectus muscle was found to be invaded by a nodule arising from the fundus of the uterus. This was dissected from the muscle and

removed with the uterus (Fig. 26). The cystic right ovary was resected. The patient made an uneventful recovery.

Endosalpingiosis of tubal type, arising from the buried stumps of the interstitial portions of the tubes, was present in both uterine cornua and was of no clinical significance. The endometriosis of the rectus muscle arose from tubules derived from the uterine mucosa (Figs. 27 and 28). The latter had filled a rent in the uterine wall, apparently caused by a traction suture. Tubules arising from this had penetrated the uterine wall above the rent and had invaded the overlying abdominal wall.

For many years it has been my practice, in ventrofixation of the uterus, to pass a figure-of-eight suture of catgut in the wall of the fundus of the uterus, leaving the ends long and use it in place of a tenaculum. The ends of the suture are rethreaded and passed through the deeper structures of the abdominal wall on both sides and tied in the closure of the abdominal incision. I believe that in this instance the needle penetrated the uterine cavity and as traction was made during the operation the uterine wall was torn from within outward. Two errors were committed at the first operation. The first was of judgment in not removing the uterus. The second was of technic in penetrating the uterine cavity with the suture and in passing it to one side of the midline of the uterus. Conditions created at the first operation later caused the patient great pain and discomfort and made necessary a second operation.

Ballin¹⁶ in 1928, published a very interesting paper on menstrual fistulas. Of particular interest are those which communicated with the uterine cavity. He states that over forty cases of this type of fistula had been reported. In one of his cases (Case 3) endometrial tissue was present in the abdominal wall and the fistula passing through this communicated with the cavity of the uterus which was adherent to the abdominal wall at this point. He believes that ventrofixation of the uterus in the presence of pelvic peritonitis seems especially prone to be followed by menstrual fistulas. If the fixation suture penetrates the uterine cavity an excellent chance for a menstrual fistula is created.

THE CLINICAL SIGNIFICANCE OF POSTSALPINGECTOMY ENDOSALPINGIOSIS

Postsalpingectomy endosalpingiosis is often of slight extent and of scientific interest only. When confined to the tubal stump or uterine cornu it is of no more clinical significance than endosalpingiosis of nonoperative origin. When it extends beyond the stump and invades other organs or structures it is liable to cause discomfort to the patient. It is difficult to determine how many of the patients in this series were required to have a second operation solely on account of the extension of the endosalpingiosis beyond the salpingectomy wound. Two of the three patients, with endosalpingiosis of the abdominal wall from the invasion of the recti muscles by tubules from the tubal stump after ventrofixation of the uterus, were operated upon solely for this condition. Three of the four patients with ovarian endosalpingiosis arising from the invasion of the ovaries by sprouts from the tubal stump and likewise three of the four patients with a similar condition of the intestinal wall were operated upon for pain-

ful "adhesions" to which the sprouts from the tubal stump contributed. There were also others in which postsalpingectomy endosalpingiosis added to the adhesions present. In addition there were two instances of pregnancy in the tubal stump, one following salpingo-oöphorectomy of one side, and the other following tubal sterilization. In the above-mentioned cases the necessity for another operation was initiated at the first. Had better judgment been exercised at the first operation or better technic been employed in the salpingectomy or tubal sterilization the indications for a second operation probably would not have arisen. On the basis of the incidence of postoperative endosalpingiosis alone salpingectomy is followed by greater possibilities of discomfort than hysterectomy.

The majority of the patients in this series were operated on again for conditions other than the coexisting misplaced müllerian mucosa in and about the tubal stump. Pain and discomfort, not relieved by conservative surgery for pelvic infection or its results, furnished a large group. There were only two instances of pregnancy in the remaining tube. Seventeen were operated upon for uterine myomata and six for cancer of the uterus. Two of the latter have subsequently died from this disease. In this group there were four cases of cancer of the body of the uterus, one intracervical (accidental finding) and one of the vaginal portion of the cervix which was treated with radium but did not respond favorably. There was only one instance of ovarian carcinoma. Had hysterectomy been done instead of salpingectomy or tubal sterilization at the first operation a second one would not have been necessary in the vast majority of the patients in this series. Aside from the incidence of postsalpingectomy endosalpingiosis, a woman without her uterus has greater assurance of good health and longevity than a woman with it.

The larger number of children born to women who have had one tube and ovary removed is the strongest possible testimony in favor of conservative surgery where subsequent pregnancy is possible. The large number of diseases to which the uterus is heir as well as the incidence of postsalpingectomy endosalpingiosis should warn us to use better judgment in the choice of operation in patients requiring salpingectomy and tubal sterilization. To deprive a woman of the possibility of having children by bilateral salpingectomy or tubal sterilization and often leave a useless uterus, an organ prone to many diseases, frequently has proved to be poor surgical judgment.

I believe it may be stated that if salpingectomy is indicated a hysterectomy should be done, except as follows:

1. In women desiring children or who should have them—when that possibility can be preserved.
2. When hysterectomy adds greatly to the dangers of the operation.
3. When the uterus is used to help support the pelvic floor.

4. In women greatly desiring to keep their uterus and who will be very unhappy if aware that it has been removed.

In our clinic we are very keen to preserve the fertility of women desiring children and always attempt to save ovarian tissue in women, especially those who have not reached the menopause. We err on the side of ovarian conservation. In saving one or both ovaries after hysterectomy we also save the attached tube if normal. It lessens raw areas and better preserves the circulation of the ovary. I have never known of endosalpingiosis arising from the severed end of the tube not removed, but believe it must occur.

Salpingectomy has a very important place in pelvic surgery. What technic should be employed to lessen the incidence of postoperative endosalpingiosis? Our own technic has been either to remove the tube *close to the uterus* or to excise a wedge-shaped piece of the uterine cornu including some of the interstitial portion of the tube and close the operative wound. Nineteen of the hundred patients were first operated upon by us and endosalpingiosis developed in eleven of these, and in four of the eleven a second operation was required to relieve the patient of conditions resulting from the endosalpingiosis which was initiated at the first. We concluded that our technic had been most favorable for the cultivation and growth of tubal mucosa. Since realizing this (over two years) we have either removed the tube with a cautery or else have cauterized the stump after severing it. We have not had an opportunity to learn the results of this change in technic. Eighty-one of the patients were first operated upon elsewhere. It was impossible to determine the exact technic of the salpingectomy in these cases. In the majority of them the tube was severed distal to the uterus and the stump ligated without attempting to bury it. It is our impression that endosalpingiosis is less likely to develop in this type of operation than in that associated with burial of the stump. On the other hand the four instances of endosalpingiosis of the intestinal wall and three of four cases of endosalpingiosis of the ovary evidently followed this type of salpingectomy. When we consider the danger of pregnancy developing in the tubal stump (two cases) I believe that excision of the interstitial portion of the tube is the operation of choice. Whether or not the cautery is of any real value I cannot say.

In ventrofixation of the uterus care must be exercised not to penetrate the uterine cavity with the fixation suture.

SUMMARY

A very important law governs the healing of operative wounds of hollow viscera and might be stated thus: "The growth of epithelium, initiated by operative injury, is confined to the repair of the lining of the viscus; it does not actually invade the walls of the organ; it ceases to grow when the wound is healed, and, when transplanted in immedi-

ate or remote operative wounds, it does not live. Fortunately this law is generally obeyed. Violations occur but they are infrequent, often transitory and usually insignificant. There is one striking exception to this rule and that is the behavior of tubal epithelium in the repair of salpingectomy wounds. Sprouts of this epithelium often invade the wall of the stump and may extend beyond the latter. It may continue to grow after healing is complete. Seedlings with the same structure as the sprouts occur in both the immediate and remote operative wounds.

Should intestinal epithelium display the same activity in the repair of appendicectomy wounds, as that shown by tubal epithelium in the repair of salpingectomy wounds, the appendix would be removed only for acute inflammatory conditions of that organ. Its removal for "chronic appendicitis" and as a routine procedure in other operations would be discouraged.

Tubal stumps from one hundred patients who had had a previous salpingectomy or tubal sterilization were studied. As bilateral salpingectomy or tubal sterilization was done in forty-seven patients, one hundred and forty-seven stumps were available. Misplaced müllerian mucosa was found in or about one hundred and twelve of these stumps as compared with sixteen instances of misplaced müllerian mucosa in two hundred cornua from one hundred uteri, with intact tubes, which had been removed by operation. Even in fifty uteri with intact tubes removed for the sequelae of salpingitis (a well-recognized cause of endosalpingiosis) misplaced müllerian mucosa was found in nineteen of the one hundred uterine ends of the tubes.

By injecting the uterine cavity with pigmented gelatin the origin of the sprouts from the tubal mucosa, in both the intact tubes and the stumps, can be more easily demonstrated than in the noninjected specimens, and their course followed as readily as the course and branches of an injected blood vessel.

A previous endosalpingiosis was probably present in only a relatively small percentage of the tubal stumps. In the majority of them it arose from the overactivity of tubal epithelium in the repair of the salpingectomy wound. Its incidence was as great in tubal sterilization stumps as those following salpingectomy for salpingitis. The condition for which the tube was removed as well as the usual type of salpingectomy are apparently of minor importance in the etiology of endosalpingiosis as compared with other factors which, at present, are not fully understood.

Postsalpingectomy endosalpingiosis usually arises from sprouts growing out from the traumatized mucosa of the tubal stump. The sprouts may be terminal or lateral. These sprouts may invade not only the wall of the stump but also may extend beyond it, invading the tissues in which it is buried or any organ or structure adherent to

the stump such as the wall of the intestine (four cases), the ovary (four cases), and abdominal wall (three cases). In addition there were two instances of pregnancy in the tubal stump.

The misplaced tubal mucosa in these lesions at times retains its original structure and at other times *assumes the structure and function of the uterine mucosa*. It presents the histologic picture of endometriosis of nonoperative origin.

In the various operative procedures, incident to salpingectomy, bits of tubal and uterine mucosa may be transplanted by the surgeon both in the immediate and remote operative field. Endosalpingiosis with the same histologic structure as the sprouts, is found (as seedlings) in situations where tubal and uterine epithelium might have been sown.

When endosalpingiosis is confined to the tubal stump it is of no more clinical significance than endosalpingiosis of nonoperative origin. When it extends beyond the stump, conditions often arise requiring a second operation. These conditions were initiated at the first operation.

Hysterectomy is followed by fewer complications than salpingectomy. A retained uterus too often requires a second operation for conditions arising in it other than postsalpingectomy endosalpingiosis.

Conservative surgery does not always conserve the health of the patient. It is important to use better judgment in the choice of operation in patients requiring salpingectomy and tubal sterilization, and if hysterectomy is contraindicated, a technic should be employed which will lessen the incidence of postsalpingectomy endosalpingiosis.

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THE OVARIAN AND PITUITARY CHANGES ASSOCIATED WITH HYDATIDIFORM MOLE AND CHORIOEPITHELIOMA

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SINCE the publication of Marchand's classical paper¹ in 1898, it has been known that hydatidiform mole and chorioepithelioma are often associated with the presence of characteristic ovarian changes which have become known as multiple lutein cysts, or, by some, as "hyperreactio luteinalis polycystica." Indeed, the statement has been generally made, and accepted, that this interesting ovarian lesion has never been observed except with choriomatous disease of the two types above mentioned. This generalization, as we shall see, no longer holds good, for at least one case has been observed in the absence of pregnancy.

In the thirty-two years since the first description of these ovarian changes, it would seem that some definite conclusion might have been reached with regard to their nature and significance, but this is not the case. In extenuation it should be borne in mind that hydatidiform mole is quite infrequent, and chorioepithelioma exceedingly rare. Moreover, the former is ordinarily treated conservatively, so that there is no opportunity to study the ovaries histologically except in the minority of cases in which their complete or partial removal is called for.

Again, it may be added that most of the reported studies upon multiple lutein cysts of this type were published when our knowledge of the histology and physiology of the ovary, still very incomplete, was really quite rudimentary. Many of the statements made, and the theories advanced, in these earlier papers are transparently incorrect when reviewed today. On the other hand, the accurate histological descriptions of many of the earlier writers upon this subject, when interpreted in the light of the more recent advances in our knowledge, constitute contributions of genuine value.

CLINICAL CHARACTERISTICS

As this paper is not primarily a clinical one, only brief reference need be made to some of the clinical characteristics of multiple lutein cysts.

Incidence.—There are not many statistics as to the frequency of association of multiple lutein cysts with choriomatous lesions. The figures most frequently quoted are those of Runge,² who found, among 144 cases, that no note of the condition of the ovaries was made in 63; in 24, the ovaries were described as more or less cystic; in 11, palpa-

tion is said to have indicated no demonstrable change; and in 28 no cystic changes were found at operation. Cottalorda's study³ showed lutein cysts to be present in 59 per cent of the cases of hydatidiform mole, and in 9.4 per cent of those of chorioepithelioma. The incidence of the ovarian changes with hydatidiform mole was found by Krömer⁴ to be exactly that given by Cottalorda; i.e., 59 per cent, while Patellani⁵ likewise estimated it at between 50 and 60 per cent.

There is much reason to question the accuracy of such statistics. They refer to cases in which there is a definite polycystic condition of the ovary, easily demonstrable at operation or palpable on pelvic examination, but they can hardly be considered an index of the incidence of lesions which, while equally characteristic, are not demonstrable except by careful histologic examination. The presence or absence of these characteristic ovarian changes cannot always be determined by palpation alone. As we shall emphasize later, very characteristic "hyperreactio luteinalis" may occur with ovaries which are little or not at all larger than normal. Such changes may be discoverable only on histologic examination, and this is only occasionally possible, for the reason that laparotomy is not often indicated in hydatidiform mole, by far the more frequent of the two causative lesions.

The second reason for doubting the accuracy of such statistics as those quoted above lies in the fact that the character and degree of ovarian change probably differ according to the stage of the intra-uterine lesion, and, to add to the confusion, this relation does not appear to be a chronologically parallel one. For example, in Penkert's case⁶ there was present in the uterus a normal embryo, the placenta showing only a small microscopic area of hydatidiform disease. Clinically there had been no vaginal bleeding whatsoever up to the time of the operation. And yet the latter disclosed perfectly characteristic, bilateral multiple lutein cysts as large as a child's head.

One of the two cases recently reported by Fruhinsholz⁷ is of very similar type, illustrating the possibility of occurrence of marked ovarian changes with only microscopic hydatidiform changes in the placenta. In other cases, again, there appears to be a definite relation between the stage of the disease and the degree of ovarian change. In the case of Joseph and Rabau (Case IV of their series⁸) no ovarian tumor was present at the first operation, but at the second, done six weeks later, the right ovary was described as being the size of a hen's egg. In Herold's carefully observed case,⁹ again, the ovaries, after removal of a hydatidiform mole, were the size of walnuts; six weeks later one was as large as the fist; three weeks later, when the operation was performed, this ovary had reached the size of a man's head, though the other ovary was still only as large as a walnut. On the other hand, I have, in a number of instances, seen enormous hydatidiform moles in which no enlargement of the ovaries could be made out by palpation.

As a matter of fact, there are some, like Santi,¹⁰ who believe that it is really the expulsion or evacuation of the cysts which gives the impetus to their growth. Penkert quotes Runge and Schmorl as having found lutein cysts in the ovaries two years after the expulsion of a hydatidiform mole. This, however, is certainly not the rule, as we shall later discuss.

Such divergent observations as have been mentioned only emphasize the incompleteness of our knowledge as to the exact relationships involved. We believe it to be highly probable that some degree of luteal hyperreaction takes place in every case of hydatidiform mole or chorioepithelioma, and that, were it possible to study each case in its day-to-day development, a greater or less degree of gross polycystic change would be demonstrable in the ovaries. The variations actually observed are not understandable because we know so little of the cause of the chorionic disease and of the pathologic physiology involved in the ovarian response to them. Certain newer additions to our knowledge, which will be discussed in this paper, give promise of throwing light on this problem.

Gross Characteristics of the Multiple Lutein Cysts.—In the most striking cases, the ovarian cysts may reach enormous size and may give rise to troublesome pressure symptoms. In Herold's case, for example, they are described as of the size of a man's head, while in other cases the ovaries may show little or no gross enlargement, although quite characteristic microscopic changes may be present. All gradations between the extremes mentioned may be noted.

Where the ovaries are large and polycystic there is a tendency to preserve the original ovoid ovarian contour, but the surface is apt to be more or less lobulated. The individual cysts are of varying size, with thin walls, while the ovarian stroma is commonly quite edematous. The walls of the cyst are smooth and usually of a yellowish tinge. The contained fluid is most often clear and of amber tinge, but in some locules is either blood-tinged or outspokenly bloody.

In cases in which the ovarian response is less pronounced, the gross changes are quite inconspicuous, and the ovaries may show little or no enlargement under these conditions. Such differences, as already mentioned, may be due to the stage at which the condition comes under observation. The corpus luteum of pregnancy may be detectable on the surface, but is often revealed only on section of the ovary. Some degree of cystic change is practically always seen, and the cysts may show the characteristics already described for the larger, genuinely polycystic ovaries.

Course of the Ovarian Lesions.—While observations on this point are not unanimous, certainly there can be little doubt that spontaneous retrogression and disappearance of the ovarian lesion is the rule after removal of the hydatidiform mole or chorioepithelioma. Mention has

already been made of the fact that some authors have noted the ovarian enlargement only after evacuation of the mole, but even in these cases there is little doubt that this is only temporary, and that it is ordinarily followed by spontaneous disappearance. Mathes,¹¹ Gouilloud,¹² Lehmann,¹³ and others have reported instances of this type. Only recently, Fruhinsholz⁷ has recorded two such cases. It is only in the occasional case, where the tumors by their size give rise to troublesome pressure symptoms or incarceration, that their removal may be indicated, as in the cases of Schröder¹⁴ and Stoeckel.¹⁵

MICROSCOPIC CHARACTERISTICS OF THE OVARIAN LESIONS, WITH ESPECIAL REFERENCE TO THE ORIGIN OF THE LUTEIN CELLS.

During normal pregnancy there is noted in the ovaries an increase in the process of atresia folliculi. Moreover, in the later stages there is often seen a striking hypertrophy of the theca interna cells, which assume an alveolar arrangement, and often invade the stroma in large irregular masses. It is these theca lutein cells which are looked upon as the analogues, in the human female, of the cells of Leydig in the testis, and which are therefore often spoken of as the interstitial cells of the ovary, although we do not know of any very convincing evidence on this point.

Certainly these theca lutein cells are not morphologically comparable to the granulosa lutein cells of the corpus luteum. They resemble much more closely the so-called paralutein cells seen in many corpora lutea, which is not surprising when one considers that their histogenesis is identical with that of the latter.

The microscopic picture of the ovarian lesions associated with hydatidiform mole or chorioepithelioma is quite varied, not only in different cases but often in different parts of the same ovary. The degree and the stage of the condition are probably chiefly responsible for the individual differences observed. The earlier studies on the subject, such as those of Wallart¹⁶ and Seitz,¹⁷ indicated that the lutein cells observed in the walls of the cysts are of thecal origin. In other words, there is not only an exaggeration of the process of atresia, with the production of many large follicle cysts, but the theca interna cells undergo a striking lutein transformation.

That this view is correct as regards some cases admits of very little doubt. In our Case 2, for example, there is no question that the lutein cells are derived from this source. Although numerous blocks were examined, the picture is everywhere fairly uniform. The lutein cells are seen in the walls of atretic follicles far advanced toward obliteration, occurring as clumps and strips beneath a heavy layer of cicatricial tissue. No trace of granulosa is to be seen, nor does it seem possible that a granulosa origin can be attributed to any of the lutein areas to be found. It seems that theca cells which had long been lying

dormant were awakened to activity by the exaggerated stimulus emanating, directly or indirectly, from the abnormal trophoblastic overgrowth. It is not strange that the picture of lutein cells apparently strewn throughout the stroma was interpreted by some of the early writers (Schaller and Pförringer¹⁸) as representing a malignant process of lutein cell origin.

On the other hand, our Case 3 presents a totally different picture. In this case the ovaries showed only slight enlargement, and none of the cysts exceeded 1 cm. in diameter. In many of them the lutein layer is unquestionably of granulosa origin. Indeed, the transition can be readily demonstrated, for in some places the basal layers consist of still unchanged granulosa cells, while the remainder of the granulosa has undergone definite luteinization. The significance of such pictures in relation to the underlying cause is considerable, for, as we shall see, it is just such pictures which may be produced in the ovary after implantation of anterior pituitary tissue, by the methods of Smith and Engle,¹⁹ or Zondek and Aschheim.²⁰

The fact that the lutein layer in this case is derived from the granulosa is further indicated by the fact that it is subjoined by another layer of hypertrophied cells, representing the theca lutein layer. This is separated from the granulosa lutein layer by a sharply marked "basement membrane." In other words, in this case the hyperluteinizing process involves both granulosa and theca, just as it does after anterior pituitary implantations or injections.

The degree of luteinization differs in various cysts, and many, indeed, show no such change at all. In some an unchanged or perhaps atrophic granulosa may be seen, while in others the cyst wall may be devoid of any epithelial lining at all, as with the ordinary atretic follicles in normal ovaries. It would seem that only at certain stages is the atretic follicle susceptible to the stimulus involved. In some follicles, again, the granulosa lutein cells are present only in patches or strips, an atypical distribution to which attention has been called by Meyer.²¹

CAUSE AND SIGNIFICANCE OF THE OVARIAN CHANGES

The cause of hydatidiform mole is still unknown, while that of chorioepithelioma is just as much a mystery as that of other forms of malignant disease. With regard to the former, many theories have been advanced, the majority attributing the disease either to inflammatory or other lesions of the endometrium, others to some defect in the ovum itself. The subject is closely linked with the cause of the associated ovarian lesions. Some have urged that the hydatidiform mole is the result of the ovarian disease, while a larger number consider the characteristic ovarian changes secondary to the hydatidiform disease. Pick²² and Fraenkel²³ were early champions of the first

theory. The latter, who first established the importance of the corpus luteum in early gestation, maintained that the interference with the corpus luteum of pregnancy produced by the polycystic ovarian lesion results in the hydatidiform degeneration of the villi.

The majority of investigators, however, hold to the view that the ovarian changes represent a characteristic response to the exaggerated trophoblastic stimulus associated with chorionatous tumors. This, for example, is the view accepted by Stoeckel,¹⁵ Wallart,¹⁶ Seitz¹⁷ and many others. Still others, among more recent writers, hold to this explanation in more or less modified form. Among these may be mentioned Penkert,⁶ Lahm,²⁴ and Schröder.¹⁴

The latter advances a viewpoint which, while speculative, is highly interesting. He believes that the factor which normally inhibits follicular activity in early pregnancy is the growing embryo itself. With hydatidiform mole this inhibitory factor is absent, possibly because of the chorionic disease. As a consequence, all stages of follicular activity may be seen. Whereas, for example, in the normal sex cycle, only one, or at most two, corpora lutea of the same age are to be found, with hydatidiform mole, all stages may be observed. In short, he attributes to the loss of this normal inhibition, and to the factor of hyperemia, the production of the ovarian changes. As already stated, this explanation is speculative, and, furthermore, it is almost certainly incorrect, in the light of more recent developments.

A great light has been thrown upon this problem by the recent epoch-making studies of Zondek and Aschheim²⁰ in Germany, and Smith and Engle¹⁹ in this country, upon the relation of the anterior pituitary to the function of the ovary. We shall not review this work here, as it has already been epitomized by one of us (Novak) in a recent paper.²⁵ Suffice it to say that the characteristic changes produced in the ovary by the anterior pituitary principles consist of hyperluteinization, hyperemia, and, under certain conditions, exaggerated follicle activity designated as superovulation. The pictures of the hyperluteinization produced in this way must at once suggest a similarity to those seen in certain cases of chorioma, such as, for example, our Case 3.

This analogy has already been urged by Aschheim²⁶ and Fels,²⁷ and there can be little doubt of its correctness. A study of the work of Evans and Long,²⁸ Smith and Engle,¹⁹ and Zondek and Aschheim²⁰ indicates the varied results produced by the anterior pituitary upon the ovary, depending upon the technic of administration, the dosage and other such factors. Similar variations are seen in the ovaries with hydatidiform mole or chorioepithelioma. Further light is thrown upon this problem by the investigations of Evans and Simpson,²⁹ which indicate that there are two hormones produced by the anterior pituitary, one of which they designate as a growth hormone, the other as a

maturity-provoking principle. Variations in the proportion of these, they suggest, explain variations in the ovarian pictures produced.

In the main, however, the experimental studies just quoted must suggest that the "hyperreactio luteinalis" associated with choriomatous tumors is the result of an exaggerated activity of the anterior pituitary. Aschheim²⁶ believes that in normal pregnancy the pituitary secretes a growth hormone of importance to the fetus, and that, in hydatidiform mole, where no fetus is present, an excess of this growth hormone exerts its influence upon the ovary. This, however, would not explain such cases as that of Penkert, in which a normal embryo was present with a microscopic mole, but in which marked ovarian changes were seen.

Greater interest attaches to Aschheim's report²⁶ of a case of hydatidiform mole, with still unchanged ovaries, in which large amounts of anterior pituitary hormone were found in the blood, urine, and also in the fluid of the hydatidiform vesicles. A similar case is reported by Fels.²⁷ An injection of 0.5 c.c. of the vesicle fluid in this case produced the typical pituitary effects in test animals. Similar results have been reported by both Fels and Aschheim in cases of chorioepithelioma. Fels suggests, therefore, that the trophoblast is responsible for the increased amount of anterior pituitary in the blood stream. Rössler³⁰ has reported a series of cases in which this biological method has been used in a quantitative way, as a means of differentiating between normal pregnancy, hydatidiform mole and chorioepithelioma, although his results need confirmation before they can be accepted. He suggests, moreover, and with much logic, that pregnancy tests should prove valuable in determining the completeness or incompleteness of removal of hydatidiform tissue, or, for that matter, of retained chorionic tissue in cases of abortion. In a very recent paper by Schultze-Rhönhof³¹ a group of cases is reported in which this test has been applied and found of great diagnostic and prognostic value.

In none of the cases reported by Aschheim or Fels, or, for that matter, in no case as yet reported in the literature, except one, has there been an opportunity of examining the pituitary gland itself. The only case, so far as we have been able to find, in which the histology of the pituitary has been studied, is one reported very briefly by Rössler.³⁰ In this case the patient died of chorioepithelioma, with extensive metastases. The autopsy showed enlargement of the anterior lobe, with a predominance of eosinophile cells, and wide blood vessels. On the anterior margin there was a heavy distribution of the basophile and eosinophile elements. He concludes that the changes suggest those seen in the hypophysis of pregnancy, though not in complete form. It must be remembered, however, that the patient lived a long time, at least a year and a half, after the extirpation of the chorio-

epitheliomatous uterus. Incidentally, it is of interest to note that the pregnancy test was still positive one and a half years after the operation.

The fact which gives interest and importance to our Case 4 is that a complete autopsy made the pituitary gland available for histological study. Before discussing the relations between the ovarian and pituitary changes, a brief report will be given of the 4 cases which supplied the incentive for this study.

REPORT OF FOUR CASES

The material upon which this study is based consists of 2 cases of chorioepithelioma and 2 of hydatidiform mole in which the ovaries, as well as the intrauterine lesion, were available for study. This is a by no means small material, especially when one considers the extreme rarity of chorioepithelioma. As a matter of fact, comparatively few of the reports in the literature have been based upon the study of more than a single case. Among the 2 cases of chorioepithelioma in our group, there is one of especial interest, because, as already stated, an opportunity was afforded to study the changes in the pituitary gland in association with this disease. The importance of this observation lies in the fact that within the past year or two evidence has been accumulating to indicate that the anterior pituitary lobe, so important in the physiology of the normal sex cycle, is probably an important factor in the production of the multiple lutein cysts under discussion in this paper. This case, incidentally, presents many other points of clinical and pathologic interest, but these have been discussed in a separate paper.³²

CASE 1.—The tissue from this case, with the clinical notes, were sent to one of us (Novak) by a surgeon in a Southern state. The patient, age twenty-four, had had a normal pregnancy four years previously. In April, 1924, she conceived again, the last menstrual date being April 7. There was slight staining for one day toward the end of May, and a recurrence of bleeding for two days early in June. On June 28, free hemorrhage began, but no embryonic tissue was expelled. Examination at this time showed the cervix to be soft but not patulous, the uterus being enlarged to the size of a four months' pregnancy.

The bleeding continuing, evacuation of the uterus was done on July 1. According to the report of the surgeon, a large quantity of "polypoid" tissue was removed, together with a small amount of placental tissue. Being under the impression that the "polypoid" tissue suggested malignancy, the surgeon performed panhysterectomy, with double salpingo-oöphorectomy.

At operation the uterus was found to be about double normal size, and soft in consistency. Both ovaries were "considerably enlarged," and contained many small cysts. Some of these were filled with a gelatinous material, some with blood. Blocks of the organs were sent to our laboratory for diagnosis.

The "polypoid" tissue was seen to be, not really polypoid, but grape-like and vesicular, being evidently a typical benign hydatidiform mole. This was confirmed by microscopic examination.

The examination of the ovarian tissue showed it to contain numerous small cysts of the follicular type. Some were lined by more or less degenerated granulosa cells, in others the granulosa had disappeared entirely. In some, however, the

granulosa was fairly well preserved, with large areas of theca lutein cells beneath it, as shown in Fig. 1. In still others, the cyst wall showed a lining, usually several layers thick, of typical lutein cells. The lutein layer was not usually complete, but showed a tendency to a patchy distribution of the cells. The relations of the lutein layer left no doubt of its origin, in these cysts, from the granulosa. A typical corpus luteum of pregnancy was also present. Unfortunately only one block of tissue was available for this examination, as the entire specimen could not be secured.

CASE 2.—This case has been previously reported by one of us (Novak),³³ though from a clinical point of view. She was thirty-four years old and had been married seventeen years, with four children, ranging from twelve to five years. There had been no miscarriages. Menstruation had been normal up to the present illness. On September 1, 1902, when the patient was presumably two and a half months pregnant, she had a profuse hemorrhage lasting fifteen minutes. Following this there was intermittent bleeding until October 10, 1902, when a large mass, weighing

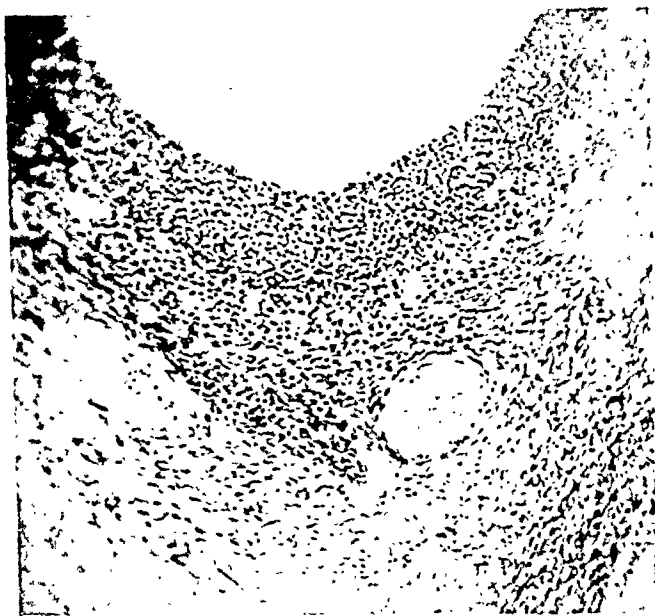


Fig. 1.—Follicle with fairly well preserved granulosa, beneath which is a large patch of theca lutein cells (Case 1), similar to those often seen in normal pregnancy. Other follicles in the same ovary showed no theca lutein change, and in some the granulosa was entirely absent. In still other areas there were follicles lined with typical granulosa lutein cells, giving a picture like that of a corpus luteum in the stage of vascularization.

3 pounds, was expelled. This was described by her physician as "pultaceous." With this, which might have been largely blood clots, there came away a large handful of small vesicles. No fetus was present, though the uterus was enlarged to the level of the umbilicus.

Shortly after this, bleeding recurred, and soon became severe, so that, when she was admitted to the Johns Hopkins Hospital on December 12, the hemoglobin had fallen to 20 per cent. The fundus at this time was three or four times the normal size, and the cervix soft and patulous. A small mass, presumably an ovarian cyst, was palpable in each side of the pelvis. After preliminary building-up treatment, panhysterectomy and double salpingo-oöphorectomy was performed on December 20. The patient made a satisfactory recovery, and was in good health on April 12, 1922, when the last report was received.

The uterus was somewhat larger than normal, and, on being opened, it presented on its anterior wall an elevated area 5 cm. in diameter, which appeared to be covered

by endometrium. Beneath the smooth surface, however, were found many small cysts typical of hydatidiform mole. This was confirmed by the microscope, which showed a hydatidiform mole with marked trophoblastic overgrowth.

The ovaries were much enlarged as a result of multiple cyst formation. The right measured $12 \times 7 \times 6$ cm., the left $9 \times 6 \times 4$ cm. The constituent cysts varied in size, the largest measuring 6 cm., in diameter. Their walls were exceedingly thin and of yellowish hue. The contents were clear and serous in character.

The microscopic picture presented by the ovaries was fairly uniform. The cysts resembled large atretic follicles which in many places had advanced to the stage of obliteration by cicatricial tissue. The granulosa was everywhere absent. Beneath the cicatricial layer, and obviously in the zone of theca interna, could be seen patches

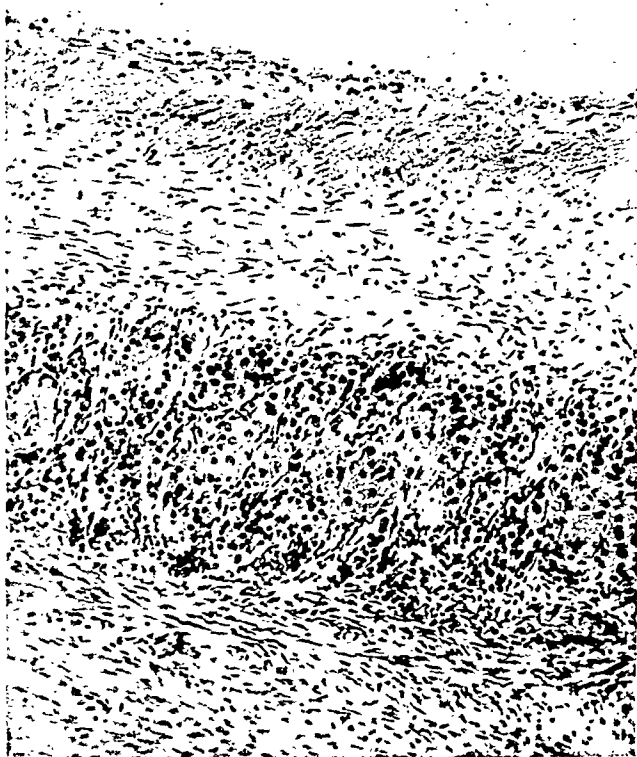


Fig. 2.—A typical field from Case 2, showing a seam of theca lutein cells deep beneath the cicatricial lining of an old atretic follicle. No granulosa, either normal or luteinized, could be found in this ovary, although many blocks were made.

and strips of large polyhedral lutein cells (Fig. 2). Here and there they formed a fairly continuous, though thin layer, while in other places only small clumps were to be seen. Even in the depths of long-obliterated atretic follicles such collections could be noted, so that they gave the impression of invading the ovarian stroma. No granulosa was anywhere to be seen, nor did it seem possible to accept any but a thecal origin for the lutein cells in this case. No corpus luteum was found.

CASE 3.—A white woman, age twenty-three, had had a stillbirth at full term in July, 1923. There was considerable bleeding for many weeks afterward, so that a curettage was done in September, and this is said to have been repeated in October and November, because of persistence of the bleeding. There was no

bleeding in December, and the patient had what she thought was a normal period in January, although she bled for two weeks. Hemorrhage recurred on Feb. 22, and continued up to the time she entered St. Agnes' Hospital, in the service of Dr. J. K. B. E. Seegar, to whom we are indebted for the history and the pathologic specimen.

Examination at this time showed the right side of the pelvis to be filled with a tumor mass, pushing the moderately enlarged uterus to the left. The cervix was firm and tightly closed.

A diagnostic curettage was done on March 29, 1924, and a large quantity of tissue, resembling blood clots and placental tissue, was brought away. Microscopic examination showed definite chorioepithelioma.

Laparotomy, on April 5, 1924, showed the uterus to be twice the normal size, and pushed to the left by a large hemorrhagic tumor filling the right side of the pelvis. The tumor mass was apparently intraligamentous and extended out to the pelvic wall. The left side of the pelvis was normal except for adhesions. It was



Fig. 3.—This unusual picture, from Case 3, seems to establish that the hyper-luteinizing reaction may involve both the granulosa and the theca. The basal layers of the granulosa, seen above, are still unchanged, while the more superficial layers show definite luteinization. Below the basement membrane is seen the theca lutein cells of pregnancy and the paralutein cells often seen in the corpus luteum.

impossible to get beyond the right-sided mass, as it extended around and beyond the iliac vessels. A supravaginal hysterectomy was done, and as much of the tumor mass was removed as possible. A number of drains were inserted because of oozing, and the abdomen closed. Death took place on April 25, presumably of extensive metastases to the lung, though autopsy was not obtained.

The pathologic examination showed the uterus to be twice the normal size, and smooth externally. The interior of the uterus was described as of meaty, hemorrhagic appearance, while on the right side the lesion extended into the broad ligament, where it formed a friable, hemorrhagic mass about 10 cm. in diameter. The ovary on this side measured $4 \times 3 \times 3$ cm., its surface showing a few small follicular cysts. On section a large number of similar small cysts were seen, together with a large corpus luteum, evidently in the stage of maturity or beginning retrogression.

On microscopic examination some of the cysts were seen to be ordinary atretic follicles, with no granulosa. Others were lined by a layer of lutein cells resembling

the wall of a corpus luteum in the stage of vascularization. In one or two areas pictures were encountered quite different from any we had hitherto seen in the ovary. The cavity of a few follicles was almost completely filled with cells which in the basal layers were typically granulosa, but which in their upper layers had undergone typical lutein metaplasia (Fig. 3). Their granulosa origin cannot be questioned, especially as the thecal cells are clearly distinguishable beneath the granulosa. Especially interesting is the fact that these thecal cells have undergone lutein transformation, similar to that often seen in pregnancy, and that the granulosa lutein cells are morphologically different from the theca lutein elements. The former resemble the lutein cells of the corpus luteum, the latter the so-called paralutein cells.

This unusual picture, it seems to us, is of vital importance in establishing the fact that the hyperluteinization associated with chorioepithelioma may involve both granulosa and theca, and not, as most authors have believed, only the granulosa or only the theca. It is of interest, also, in that it is similar to certain pictures which have been produced by pituitary implantations or injections, as has already been mentioned.



Fig. 4.—Typical theca-lutein changes (Case 4), with degeneration of the granulosa, which is retracted from the theca. Many of the follicles in this case, however, show only the ordinary picture of atresia folliculi.

CASE 4.—The patient, age thirty-one, had been curetted in another hospital on July 13, exactly five months before admission to the Johns Hopkins Hospital. She had had four children. A normal menstruation had occurred on June 16, lasting three days, but bleeding recurred on July 3, continuing up to the time of the curettage on July 13. Numerous small bits of tissue were removed at this operation, although they did not, according to the attending surgeon, suggest placental tissue. The microscopic examination, however, revealed what was considered “retained chorionic tissue.”

On November 13 the patient was admitted to the Johns Hopkins Hospital, in the service of Dr. Dandy. She had suffered with such symptoms as headaches and loss of vision for several months, and, without going into details, a diagnosis was made of brain tumor. This was confirmed at operation on November 17. The tumor proved to be a typical chorioepithelioma of the left occipital lobe. The patient died on November 19. The autopsy revealed extensive metastases also

present in the lungs, but the chief point of interest was the fact that the primary tumor in the uterus had entirely disappeared. This interesting case is reported in full in another paper by the present authors.³²

The ovaries, with which we are more directly concerned in the present connection, showed only slight enlargement, and, on section, presented a considerable number of small cysts. Many of them are simple atretic follicles, usually without a granulosa layer. Others showed a very definite lutein transformation of the theca interna (Fig. 4), while one rather large cyst was lined by a typical lutein layer derived from the granulosa. This is indicated, among other things, by the fact that the theca interna in parts of the same cyst, likewise shows luteinization, the line of demarcation between the two being clearly marked.

The histologic changes in the pituitary were of especial interest, for reasons already mentioned. They are, therefore, discussed below in some detail, with a preliminary consideration of the normal anterior lobe, and some of its physiologic variations.

THE NORMAL HISTOLOGY OF THE ANTERIOR PITUITARY LOBE

In accordance with their size, form, and staining reactions three types of cells may be distinguished in the anterior lobe. Two, because of their affinity for stains, are spoken of as chromophile cells, this group embracing an acidophile or eosinophile variety, and a basophile type. The remaining group, showing no affinity for stains, is represented by the so-called chromophobe cells.

The acidophile cells are polyhedral, with a nearly homogeneous cytoplasm, which is almost filled with coarse acidophilic granules. The nuclei are small, spherical, and stain deeply with hematoxylin.

The basophile cells are somewhat larger, the cytoplasm being filled with coarse basophilic granules, and the nucleus slightly eccentric.

The chromophobe cells are much smaller than the other two types, and not so well outlined. The cytoplasm is scant, and the nucleus round, rather small, and rich in chromatin.

In the human these cells exhibit no very characteristic distribution. The eosinophiles and basophiles show a tendency to form alveoli or cell cords, between which course wide capillaries, with delicate walls. The chromophobes are found chiefly in groups or nests in the centers of these alveoli, and are therefore farthest away from the capillaries. The acidophiles form numerically the largest group.

The most satisfactory staining technic for the study of these cells is that described by Bailey,³⁴ for use after fixation in either Regaud's solution or formol-Zenker. A modification of Bailey's stain has recently been employed by Kindell,³⁵ of the Department of Pathology at the Johns Hopkins Medical School. After fixation in either of the two solutions already mentioned, the blocks are imbedded in paraffin, sectioned and stained with acid fuchsin-methyl blue. This differentiates the two types of granules very sharply. The acidophile (alpha) granules stain bright red, the basophilic (beta) granules a deep blue.

There has been considerable difference of opinion as to whether or not the three cell types above described represent merely different

phases of activity in the production of a single secretion. The weight of evidence, however, points to their physiological individuality. This view is urged by Bailey and Davidoff³⁶ on the basis of their studies upon the eosinophilic adenomata so characteristically found in acromegaly, basophilic granules never being found in hypophyseal adenomas. They therefore feel that the alpha granules represent the secretory product having to do with growth. A similar conclusion as to the individuality of these two types was reached by Smith (P. E.) and Smith (I. B.)³⁷ from their studies upon the bovine hypophysis, where there is at least a partial histologic separation of the two types. The same view is expressed in the more recent paper of Evans and Simpson,²⁹ to which further reference will be made below.

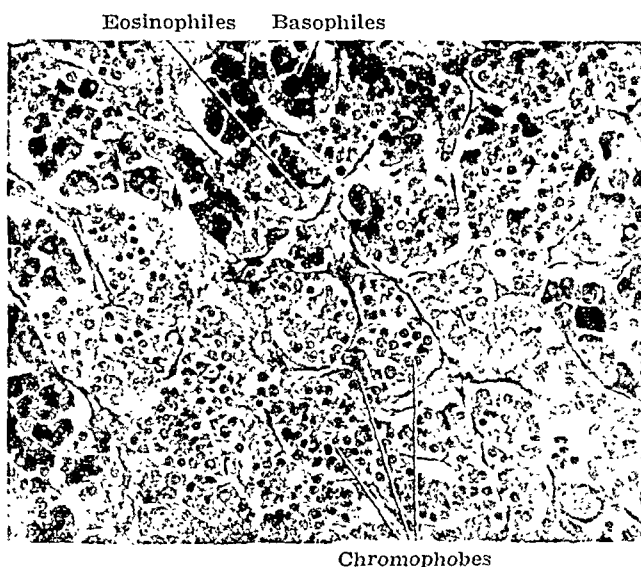


Fig. 5.—Showing the histology of the normal anterior pituitary, with the theca types of cells (see text).

THE PITUITARY AFTER CASTRATION

It is a well-known fact that hypertrophy of the anterior pituitary is one of the results of castration. Engle, moreover, has recently shown that in rats which had been castrated eight months previously, the anterior pituitary yielded a greater amount of the gonad-stimulating hormone than does the normal gland. This was indicated by the premature sex maturation of the animals and by characteristic ovarian changes produced in the latter. Histological examination of the hypophysis in these castrated animals showed a marked increase in the number and size of the basophiles. Intracellular vacuoles, diminishing the amount of cytoplasm, were construed by Engle³⁸ as representing storage of the hypophyseal sex hormone. Be that as it may, the characteristic increase in the size and number of the basophiles, together with the increase in the physiologic effect upon the ovaries, justify the belief that these cells elaborate the hypophyseal

sex hormone. Corroborative evidence is found in the statement of Rasmussen,³⁹ that the basophile cells are, in the marmot, more abundant during estrus.

THE PITUITARY IN PREGNANCY

The changes in the human pituitary during pregnancy have been fully studied by Erdheim and Stumme,⁴⁰ and have been again described more recently, in another valuable contribution by Erdheim.⁴¹ Increase in size of the hypophysis is the rule in pregnancy, especially in the later stages. This is sometimes so marked as to cause pressure on the optic chiasm, with even such symptoms as partial bilateral hemianopsia. The pronounced enlargement and coarsening of the features in late pregnancy is also presumably of pituitary origin. Similar changes have been described by Cushing⁴² in the anterior lobes of the pregnant bitch, cat, and rabbit.

Basophiles

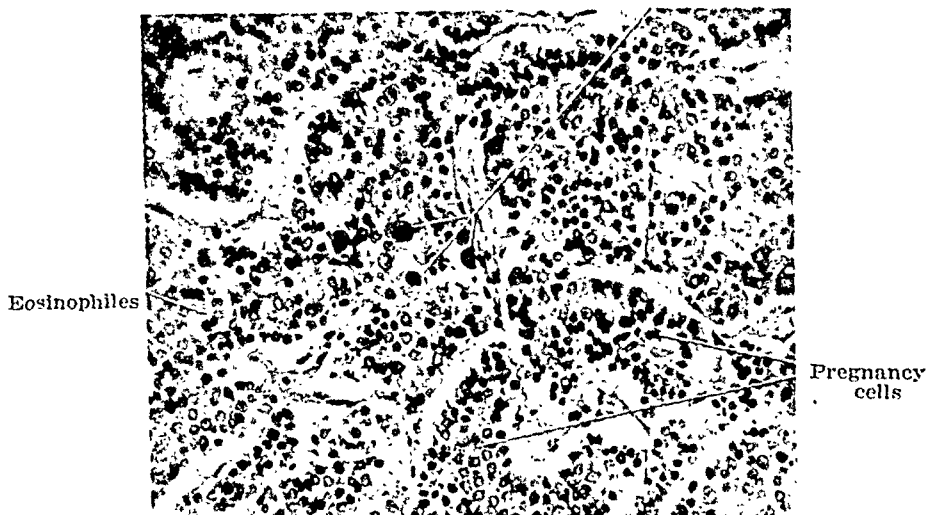


Fig. 6.—The anterior pituitary of pregnancy (seven months). Note especially the increase in size of the cell cords, and the transformation of the chromophobes into the so-called pregnancy cells.

Histologically, the chromophobe cells practically cease to exist as such in pregnancy, being transformed into large cells, with clear and somewhat irregular nuclei (*Schwangerschaftszellen*). The abundant cytoplasm is filled with fine dust-like granules staining pink with acid fuchsin and eosine. Transitions may be seen between these cells and the eosinophile cells, with their coarser granules. The cells are grouped in broad columns which line the capillary sinuses, crowding out the normally dominant coarsely granular eosinophiles. It is the increase in these modified chromophobes, or pregnancy cells, which is responsible for the enlargement of the anterior lobe. Neither the eosinophiles nor basophiles appear to show any increase or decrease above or below the normal, although usually they are displaced toward the centers of the cell column.

THE PITUITARY IN OUR CASE 4

The histologic changes in the anterior pituitary lobe in our Case 4 need not be detailed, inasmuch as they showed exactly the picture described above as characteristic of pregnancy. It should be emphasized, however, that in our patient the curettage had been performed and the pregnancy terminated at least four months previously, and at a very early stage. The significance of this lies in the fact that, according to Erdheim, within seven weeks after parturition the modified chromophobe cells (*Schwangerschaftszellen*) return to their normal condition, as observed in the nonpregnant state, although their number may remain larger than before.

As the pituitary in our case, in which the pregnancy was terminated at a very early stage several months previously, still showed changes

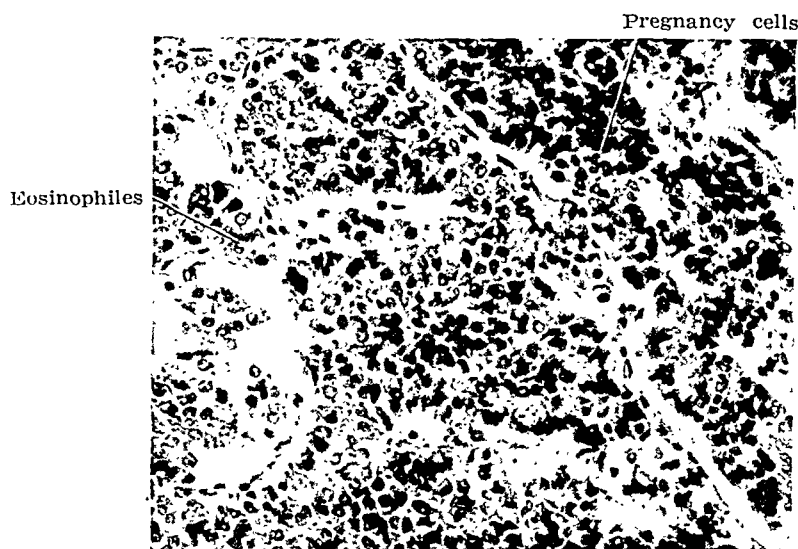


Fig. 7.—The anterior pituitary of our Case IV (chorioepithelioma). The cell cords are even larger than those of the normal pregnancy hypophysis shown in Fig. 6, the other changes being of the same type.

comparable to those of normal full-term pregnancy, it seems probable that the original pituitary response to the abnormal pregnancy was far greater than that occurring in normal gestation. On the other hand, and this is probably a much more important factor, a large amount of trophoblastic tissue was still present in the patient's body, in the form of the cerebral and pulmonary metastases. This view matches up with the biologic studies made by Schultze-Rhnhof in one of his cases of chorioepithelioma. In his patient the pregnancy test was strongly positive one and a half months after total extirpation of the uterine tumor. X-ray examination, however, showed extensive metastases in the lung.

When one considers that in normal pregnancy there is only a relatively slight lutein reaction in the ovary, one must, if the intermediary rôle of the pituitary in producing these changes be accepted, presump-

pose a profound increase of the pituitary hormones to explain the conditions represented by the luteal hyperreaction of hydatidiform mole and chorioepithelioma. The evidence furnished by our own case, together with the studies of Aschheim,²⁶ Fels²⁷ and others, already mentioned, indicate that the trophoblast is the normal stimulus to the pituitary. In other words, it seems likely that the ovarian changes may be looked upon as a response to the pituitary hyperfunction, and not directly to the ovum, whether this be normal or abnormal. A rather crucial observation would be to determine whether, in the absence of pregnancy, the pituitary itself can, under any circumstances, call forth changes in the ovary similar to those of hydatidiform mole or chorioepithelioma. Such an observation has actually been reported by Wagner.⁴³ In this as yet unique case, the patient was operated upon for a pelvic mass, diagnosed as probable extrauterine pregnancy. There had been amenorrhea for four months, although menstruation had been irregular, with frequent amenorrhea, for five years. Incidentally, colostrum was present in the breasts. At operation the uterus was found to be of the size of a six weeks' pregnancy, while both ovaries were the seat of polycystic tumors, typical of those seen with hydatidiform mole or chorioepithelioma. Fearing that there might be an unsuspected chorioepithelioma, Wagner performed a radical operation.

No trace of an embryo was found in the uterus, although the mucosa showed some decidual change and some ectopic decidua was found on the posterior surface of the uterus. The microscopic examination of the ovaries showed typical multiple lutein cysts, with marked increase of granulosa lutein tissue.

The later course of the patient was of great interest and significance, inasmuch as she developed symptoms suggesting a pituitary tumor, and this was confirmed by examination. The tumor was considered to be a benign adenoma, and was treated by the x-ray instead of surgically. This case is interpreted by Wagner as demonstrating that characteristic pregnancy changes in the ovary, or changes similar to those seen with choriomatous tumors, can be provoked by pituitary lesions in the absence of pregnancy.

As bearing on this point, mention may be made of the experiments of Baniecki,⁴⁴ who was able to initiate typical pregnancy changes in the anterior hypophyseal lobe of guinea pigs by the injection of placental extracts. This observation would formerly have been difficult to explain, but the recent demonstration by Collip⁴⁵ and by Philipp⁴⁶ that the placenta yields not only the follicle hormone, but also the anterior pituitary secretion, illuminates it very much. Philipp, indeed, believes that the hormone is produced by the placenta, and that the latter is not merely a storing place for it. He goes so far as to state that the Zondek-Aschheim pregnancy test is really a placental rather

than an anterior pituitary reaction. The whole question is, of course, still quite confused, and many of the reported observations are more or less contradictory. This applies not only to the problem of the anterior pituitary hormone, but also to the older one of the ovarian follicle substance, and of course to the interrelationship of the two. This, however, is not the place for an extensive discussion of these matters.

In the main, the evidence indicates that the anterior pituitary is not only the "motor of the ovary" in its normal cyclical activity, but that it likewise is the direct cause of the ovarian changes of normal pregnancy and of hydatidiform mole and chorioepithelioma. The underlying stimulus of the pituitary, in turn, probably emanates from the trophoblast, although it may apparently, in the light of Wagner's observation, be provoked by primary pituitary lesions.

It is too early to speak of the relative importance in this connection of the two secretions which, according to Evans and Simpson,²⁹ are produced by the anterior lobe, and it is quite possible that there are individual variations in different cases and in different stages of the same case. If the reliability of the method of separation of the two principles outlined by Evans and Simpson is established, it would seem that the problem will be open to experimental attack. For the present, however, the results of the enormous amount of experimental work of the past two years or so have not been entirely crystallized, and there are still a number of contradictions in the work and views of those studying the problem. These will, no doubt, be eliminated as the work advances. But even now we may accept as established the far-reaching fact that the anterior pituitary is of fundamental importance in the sex cycle, that it exerts its effect through and upon the ovaries, and that it must play a part in the production of such pathologico-physiologic disturbances as those we have been discussing.

SUMMARY

This paper is based upon the study of two cases of hydatidiform mole and two of chorioepithelioma, in all of which the ovaries were available for study, while in one of the cases of chorioepithelioma a histologic study of the pituitary was also possible. The importance of such observations at the present time is especially great, because of recent developments in our knowledge of the physiologic interrelationships between the ovaries and the anterior pituitary. The remarkable "hyperreactio luteinalis" which probably occurs at some stage in every case of hydatidiform mole and chorioepithelioma, but which does not always assume the form of the so-called multiple lutein cysts, is definitely comparable to the ovarian changes which are produced by anterior pituitary implantations or injections. Histologic studies, such as those included in this report, and also the biochemical studies

which have been described by a number of authors, leave little doubt that the anterior pituitary is the immediate cause of the lutein hyper-reaction seen in the ovaries of such cases. Our own studies indicate that the hyperluteinization involves both the granulosa and the theca interna.

The histologic study of the anterior pituitary in one of our cases of chorioepithelioma showed an abnormally marked and persisting pregnancy reaction. This observation, for the first time, offers a histologic explanation for the persistence of the pregnancy test long after removal of the primary tumor, as has been reported by two or three recent authors. This abnormally persistent pregnancy reaction in the pituitary, with the persistence of the pregnancy test, is no doubt due to the presence of considerable masses of trophoblastic tissue in the metastases, as was almost certainly the case in our patient. In short, the evidence indicates that the interreaction is a triangular one, the trophoblastic increase being responsible for the pituitary reaction, and the latter, in turn, calling forth the abnormal ovarian response.

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SOME OBSERVATIONS ON THE ETIOLOGY OF DYSFUNCTIONAL UTERINE BLEEDING

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THE present-day conception of the etiology of dysfunctional uterine bleeding ascribes it to a disturbance of pelvic physiology, discarding as obsolete the older theories that related it to a local disease of the uterine wall or endometrium.

The modern theory has been gradually evolved during the last thirty years by Cullen, L. Fraenkel, Hitschmann and Adler, Schroeder, Robert Meyer, Emil Novak, and others, and is being confirmed, though somewhat modified by recent discoveries, in ovarian hormonology. It was first definitely epitomized by Robert Schroeder, who studied the ovaries and endometria of 53 patients hysterectomized for dysfunctional bleeding. His conclusions may briefly be summarized as follows:

The normal phases of the endometrial cycle are induced by two ovarian hormones, widely different and probably antagonistic in their properties. The maturing follicle, through the agency of its growth hormone, governs the first proliferative stage of the endometrial cycle during which the glands become hypertrophied, lengthened and tortuous. Ovulation takes place at a varying time near the middle of the menstrual cycle. The hormone of the newly-formed corpus luteum (corpus granulosum) alters the morphology of the endometrium and transforms it into a secretory organ in preparation for the nidation of the fertilized egg.

If from some defect in the motor impulse (located by Schroeder in the germ plasm of the egg) ovulation does not take place, the graafian follicle persists and no corpus luteum (granulosum) is formed. Consequently, the endometrium, in the absence of the hormone of the corpus luteum, does not undergo the customary premenstrual secretory change; but, under the continued influence of the persisting follicle, acquires an irregular growth commonly called gland hypertrophy or gland hyperplasia. (Since these terms are often misleading, I have adopted in their place the word *dysplasia* as better expressing the incoherent nature of the process.)

Minor defects of ovulation or corpus luteum integrity produce corresponding variations in the endometrium and the menstrual rhythm.

The dysplasia of the endometrium results finally in localized areas of thrombotic necrosis with crumbling of the tissues and consequent hemorrhage.

Schroeder found the foregoing factors constantly present in his 53 cases; namely, absent or defective corpus luteum, persisting follicle or follicles, gland dysplasia, and localized necrosis. His work has not been universally accepted.

The present paper records an attempt to test the theory by a series of personal observations.

I. The first investigation consisted of a repetition of the work of Schroeder. For this purpose I was able to collect the uterus and ovaries of 18 patients who had been subjected to hysterectomy and ablation of the ovaries for severe dysfunctional bleeding. Only those cases were included which were free from fibroid tumors, or from lesions that might produce accidental bleeding.

The cases are abstracted severally and the results tabulated.

HYSTERECTOMY SERIES: DYSFUNCTIONAL BLEEDING

CASE 1.—E. F. Path. No. 15318. Age forty-two. Married, 2 children. Menorrhagia and metrorrhagia, five years. One ovary previously removed. Endometrium: Gland dysplasia. Localized areas of necrosis. Ovary: Several persistent follicles. No corpus luteum. Myometrium: Small round cell infiltration. So-called "metritis."

CASE 2.—L. L. Path. No. 6353. Age twenty-three. Single. Constant metrorrhagia, several years. Two previous curettings. Endometrium: marked "Swiss-cheese" dysplasia. Ovaries: Right, several persistent follicles. Left, small old corpus luteum. Myometrium: Negative.

CASE 3.—M. W. Path. No. 16473. Age fifty-one. Married, 3 children. Menorrhagia, two years. Endometrium: Gland dysplasia, bizarre. Extravasation of blood. Surface necrosis. Ovaries: Right, involuted corpus luteum turning to albicans. Two persisting follicles. Rich granulosa. Left, persisting follicle cyst with rich granulosa. Myometrium: Hypertrophied.

CASE 4.—A. G. Path. No. 15789. Age forty-eight. Married, 11 children. Menorrhagia and metrorrhagia, 5 years. Endometrium: Gland dysplasia, bizarre, "Swiss-cheese." Areas of blood extravasation, and necrosis. Ovaries: Right, no corpus luteum. Left, no corpus luteum. Several cystic follicles. Myometrium: Hypertrophied.

CASE 5.—K. H. Path. No. 11379. Age forty. Married, 3 children, 2 miscarriages. Prolonged menstruation, but periods regular. Endometrium: Gland dysplasia with marked hyperplasia, and invagination of glands. Extensive local extravasation of blood with necrosis. Ovaries: Right, no corpus luteum. Left, cystic corpus luteum deficient (note periodicity of etc.). Myometrium: Negative.

CASE 6.—M. H. Path. No. 10989. Age forty-one. Married, 7 children. Menorrhagia, one year. Previous curetting (6 months). Endometrium: Gland dysplasia. All three phases represented. Marked subepithelial hemorrhages. Thrombosis of vessels. Ovaries: Right, follicle cyst. Left, collapsed corpus luteum (7 mm.). Two persisting follicles. Myometrium: Hypertrophied.

CASE 7.—J. B. Path. No. 13729. Age forty-three. Married, 3 children. Severe metrorrhagia, 2 months following skipping. Endometrium: Gland dysplasia. Shaggy, bizarre, dilated glands, mixed types. Some extravasation of blood. Thrombosis of vessels. Ovaries: Right, large follicular cyst. No corpus luteum. Left, old disintegrating corpus luteum (2 months). Myometrium: Great hypertrophy with edema (proidentia).

CASE 8.—E. McG. Path. No. 10751. Age thirty-five. Married, 4 children. Menorrhagia, 7 months. One ovary previously removed. Endometrium: Gland dysplasia, shaggy, mixed phases, dilated glands. Thickened stroma. Marked extravasation of blood with crumbling. Ovary: (Single.) No corpus luteum. Large cystic follicle. Myometrium: Negative.

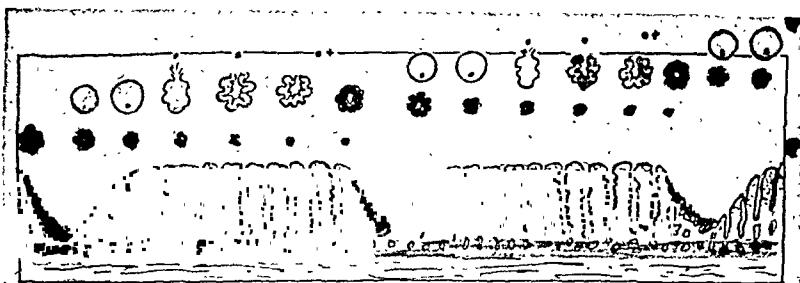


Fig. 1. Normal Menstruation

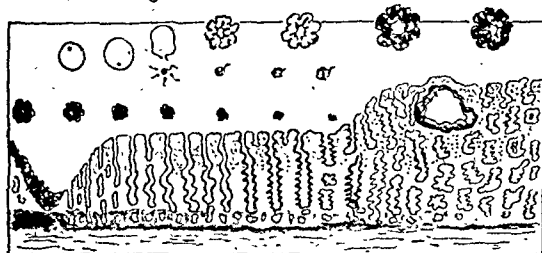


Fig. 2. Pregnancy.

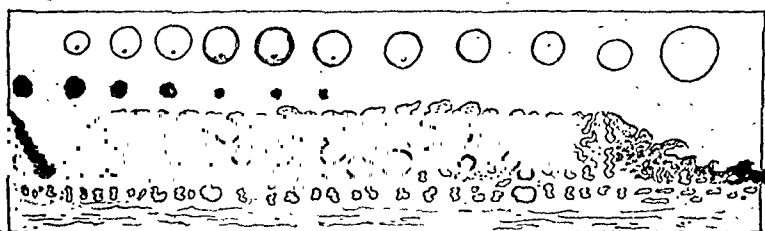


Fig. 3. Endometrial Dysplasia.

Fig. 1.—Diagram showing the parallelism between the phases of the follicle and endometrium during a normal menstrual cycle. The middle row of diminishing figures indicates the involution of the preceding corpus luteum. The upper row of figures illustrates the development of the graafian follicle. As it develops its hormone produces characteristic growth changes in the endometrium. Near the middle of the cycle the follicle bursts, ejects the egg and becomes a corpus luteum (more accurately called the corpus granulosum, as it is not yellow at first). The corpus granulosum functions up to the 28th day, inducing by means of its special hormone secretory changes in the endometrial glands. The egg, if unfertilized, dies supposedly on the 28th day. With the death of the egg the corpus granulosum begins to degenerate, turns yellow and gradually involutes. The cyclic changes in the endometrial glands are depicted. At first simple tubular structures, the glands become hypertrophied and tortuous under the influence of the growth hormone of the developing follicle. As soon as the corpus granulosum is formed, their structure is altered to that of a secretory organ. The epithelium assumes the beaker-form of secreting cells, and the glands exhibit a saw-toothed (sägeformig) appearance. When the egg dies and the corpus granulosum collapses, the endometrium disintegrates down to the basal layer, crumbles, desquamates, bleeds and rapidly regenerates (menstruation).

Fig. 2.—The ovarian and menstrual cycle in pregnancy. The first part of the cycle is like that of normal menstruation. If the egg is fertilized, the collapse of the corpus granulosum and endometrium does not take place. The corpus granulosum grows larger and continues its hormonal influence on the endometrium. The endometrium persists as a secretory organ, becoming the decidua and retaining as such the characteristics of its premenstrual stage in a more pronounced form.

Fig. 3.—The follicle and endometrium in a typical case of dysfunctional bleeding. The middle row of figures shows the involuting corpus luteum. The top row shows the developing follicle which at the proper time fails to burst, discharge the egg, and become a corpus granulosum (ovulation). The follicle persists and continues to exert by means of its hormone a growth influence on the endometrium. The glands undergo an irregular hypertrophy (dysplasia). In the absence of a corpus granulosum there is no secretory phase. In a typical case menstruation does not take place. The dysplasia of the endometrium results in localized thrombosis and necrosis, with consequent crumbling and hemorrhage. The persistent follicle or follicles become cystic, and either by their own secretion or by that of the pituitary body may maintain the dysplastic condition for an indefinite period. If the endometrium is curetted it usually regenerates in the form of dysplasia.

The diagram represents only a typical case. There may be many variations. For

CASE 9.—M. C. Path. No. 10956. Age thirty-seven. Married, 9 children. Polymenorrhea (2 weeks' intervals, 10 days flow). Endometrium: Gland dysplasia. Mixture of phases. Great hypertrophy of surface epithelium. Dense hypertrophy of stroma. Subepithelial blood extravasation. Ovaries: Right, old disintegrated corpus luteum cyst. Several persisting follicles, one with ovum. Left, very small. No corpus luteum. No follicles. Myometrium: Negative.

CASE 10.—R. K. Path. No. 15252. Age forty-five. Married, 6 children. Metrorrhagia, 6 months. Endometrium: Gland dysplasia. Great variation in thickness of mucosa, mixture of phases. Subepithelial extravasation. Thromboses. Crumbling. Ovaries: Right, small old collapsed corpus luteum, beginning disintegration. Left, old corpus hemorrhagicum. Myometrium: Hypertrophied.

CASE 11.—M. M. Path. No. 14024. Age fifty. Married, 2 children. Metrorrhagia, 3 years. Endometrium: Gland dysplasia in an atrophied mucosa. Thickened stroma. Sclerotic blood vessels. Extravasation and desquamation. Hyper-

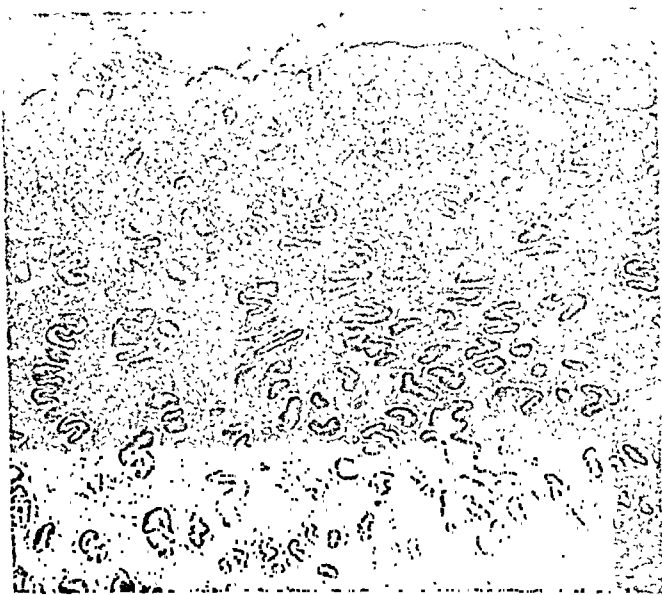


Fig. 4.—Normal proliferative stage of the menstrual cycle. The glands show a uniform growth and tortuosity.

trophy of epithelium. Glands few but hypertrophied. Ovaries: Right, old follicle cyst. No corpus luteum. Left, no corpus luteum. No follicles. Myometrium: Enormous hypertrophy, with edema and arteriosclerosis.

CASE 12.—J. D. Path. No. 16011. Age thirty-three. Married, 2 children. Severe metrorrhagia, 5 months. Menorrhagia (regular), several years. Previous curetting and radium (non-sterilizing dose). Endometrium: Gland dysplasia in mild degree. Glands greatly hypertrophied with branching and dipping into muscularis. Type fairly uniform. General extravasation of blood in stroma. Ovaries: Right, no corpus luteum. No follicles. Left, old corpus luteum with beginning fibrosis. Persistent follicle cysts with rich granulosa. Myometrium: Extremely flaccid but microscopically negative.

example, ovulation may be incomplete and the corpus granulosum defective. In such a case, the endometrium may be under the influence of both the follicle and the corpus hormones. The menstruation would then be periodic but abnormally profuse or prolonged. The endometrium would show a mixed picture of both proliferative and premenstrual phases. Figs. 1, 2, 3 are adapted from Schroeder.

CASE 13.—K. McL. Path. No. 12625. Age thirty-seven. Married, 1 child. Severe polymenorrhea. Endometrium: Gland dysplasia. Mixed phases in great profusion. Swiss-cheese formation. Extravasation of blood with some surface destruction. Ovaries: Right, small. No corpus luteum. A few cystic follicles. Left, small. No corpus luteum. Myometrium: Negative.

CASE 14.—B. P. G. Path. No. 16135. Age forty-five. Single. Polymenorrhea and metrorrhagia. Endometrium: Gland dysplasia. Swiss-cheese type. Extravasation of blood. Vessels engorged. Thrombosis. Crumbling. Ovaries: Right, large follicle cyst. No corpus luteum. Left, Several persisting follicles. No corpus luteum. Myometrium: Some "chronic metritis."

CASE 15.—A. M. Path. No. 13310. Age forty-four. Married, 1 child. Metrorrhagia, 5 months, after delayed menses. Previous curetting. Endometrium: Gland dysplasia. Mixed phases. Swiss-cheese formation. Blood extravasation with engorgement and thrombosis of vessels. Ovaries: Right, several small follicular cysts. No corpus luteum. Left, follicular cyst. No corpus luteum. Myometrium: Enormous hypertrophy.

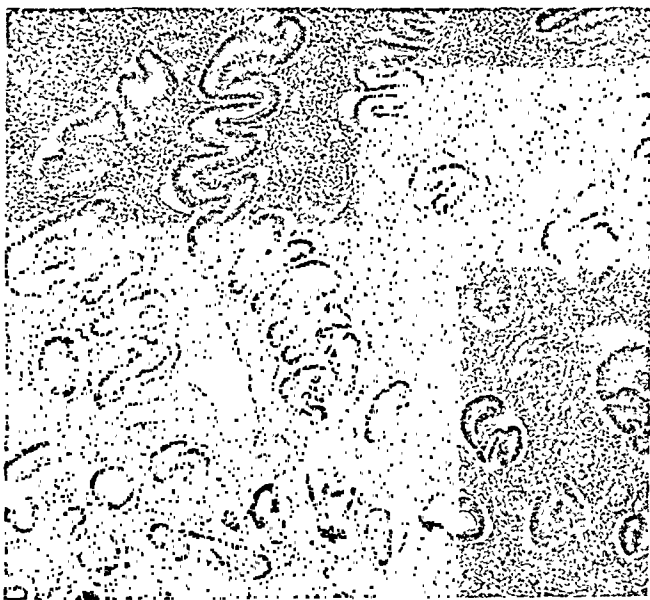


Fig. 5.—A close-up of a normal gland in the proliferative stage. It illustrates well the term "Schlängelung" (snakiness) used by the Germans.

CASE 16.—A. J. Path. No. 13640. Age thirty-seven. Married, 2 children. Menorrhagia with metrorrhagic spotting. Endometrium: Gland dysplasia. Mixed phases. Much dilatation. Areas of subepithelial extravasation of blood. Marked thrombosis of vessels. Ovaries: Right, several cystic follicles. No sign of corpus luteum. One persistent follicle with rich granulosa. Left, several follicle cysts. No corpus luteum. Myometrium: Moderate hypertrophy.

CASE 17.—E. S. Path. No. 13985. Age forty-seven. Single. Metrorrhagia, 3 months. One ovary removed at previous operation. Endometrium: Gland dysplasia. Enormous hypertrophy and hyperplasia. Bizarre. Swiss-cheese formation. Subepithelial extravasation of blood with local necroses. Ovary: (Single.) Two follicle cysts. No corpus luteum. Myometrium: Hypertrophied.

CASE 18.—M. K. Path. No. 17434. Age forty-eight. Married, no children. Metrorrhagia, 2 months. One ovary removed 12 years before. Endometrium: Gland dysplasia. Mixed phases in profusion. Swiss-cheese formation. Traces of

old blood in stroma. Desquamation of compacta. Adenomyosis in one cornu. Ovary: (Single.) Old follicle cyst, losing its lining. No corpus luteum. Myometrium: No hypertrophy.

HYSTERECTOMY SERIES: DYSFUNCTIONAL BLEEDING. 18 CASES

| CLINICAL DATA | | | | | | | | | | | | | Cases |
|--|---|---|---|---|---|---|---|---|---|---|---|---|-------|
| Age: | | | | | | | | | | | | | |
| 20-30 | - | - | - | - | - | - | - | - | - | - | - | - | 1 |
| 30-40 | - | - | - | - | - | - | - | - | - | - | - | - | 5 |
| 40-51 | - | - | - | - | - | - | - | - | - | - | - | - | 12 |
| Condition: | | | | | | | | | | | | | |
| Married | - | - | - | - | - | - | - | - | - | - | - | - | 15 |
| Single | - | - | - | - | - | - | - | - | - | - | - | - | 3 |
| Pregnancies in 15 Married Women: | | | | | | | | | | | | | |
| Fertile | - | - | - | - | - | - | - | - | - | - | - | - | 14 |
| Sterile | - | - | - | - | - | - | - | - | - | - | - | - | 1 |
| Total number of pregnancies | - | - | - | - | - | - | - | - | - | - | - | - | 57 |
| Average | - | - | - | - | - | - | - | - | - | - | - | - | 3.8 |
| Symptomatology: | | | | | | | | | | | | | |
| Metrorrhagia | - | - | - | - | - | - | - | - | - | - | - | - | 17 |
| Menorrhagia (atypical) | - | - | - | - | - | - | - | - | - | - | - | - | 1 |
| MYOMETRIUM | | | | | | | | | | | | | Cases |
| Hypertrophied | - | - | - | - | - | - | - | - | - | - | - | - | 9 |
| No change | - | - | - | - | - | - | - | - | - | - | - | - | 7 |
| "Metritis" | - | - | - | - | - | - | - | - | - | - | - | - | 2 |
| OVARIES | | | | | | | | | | | | | |
| Corpus Luteum absent | - | - | - | - | - | - | - | - | - | - | - | - | 10 |
| Old degenerating corpora lutea | - | - | - | - | - | - | - | - | - | - | - | - | 8 |
| Recent corpora lutea | - | - | - | - | - | - | - | - | - | - | - | - | 0 |
| Follicle cysts present | - | - | - | - | - | - | - | - | - | - | - | - | 18 |
| ENDOMETRIUM | | | | | | | | | | | | | |
| Gland dysplasia | - | - | - | - | - | - | - | - | - | - | - | - | 18 |
| Subepithelial hemorrhage with local necrosis | - | - | - | - | - | - | - | - | - | - | - | - | 18 |
| Previously curetted (within 6 months) | - | - | - | - | - | - | - | - | - | - | - | - | 4 |

A perusal of the foregoing cases will show that the results of analysis tally closely with those of Schroeder. The chief points to be noted are:

1. Arrhythmic metrorrhagia appeared in the histories of 17 of the 18 cases. One showed a severe polymenorrhea, with prolonged flowing.
2. In every case the endometrium revealed a characteristic dysplasia of the glands.
3. In 10 cases no corpus luteum could be found microscopically or macroscopically. In 8 cases there was evidence of old degenerating corpora lutea, antedating a normal cycle.
4. In all 18 cases, one or more cystic follicles were found in one or both ovaries.
5. In all 18 cases, subepithelial hemorrhage was present in the endometrium, and in many there were localized areas of vessel-thrombosis with necrosis and crumbling of the mucosa. This observation, strongly emphasized by Schroeder, has been frequently denied by others.

II. The next investigation undertaken was a clinical and histological analysis of 237 consecutive private cases biopsied and treated with radium for excessive or untimely bleeding. The list comprises only cases in which the preoperative examination detected no associated pathology other than that of small fibroids. In this analysis numerous data of clinical interest were revealed, but these will be reserved for a later report. Interest for the present centers chiefly on the question of the frequency of gland dysplasia and the relationship of small fibroids in dysfunctional uterine bleeding.

The occurrence of gland dysplasia with dysfunctional bleeding has been variously estimated as from 10 per cent by Schickele and Keller up to approximately 100 per cent by Schroeder, Emil Novak, and



Fig. 6.—Typical premenstrual endometrium. The saw-toothed (*sägeförmig*) character of the glands is well shown. Under higher power the epithelium would be seen to be tufted and beaker-shaped, with evidences of secretion in the gland lumens. If this picture is uniform throughout the endometrium, it may confidently be said that the corpus granulosum is normal and that the following menstruation will be on time and consistent in amount with the normal habit of the patient.

others. Adler denies any connection between glandular changes and abnormal bleeding. (Halban-Seitz, IV, Band, p. 150.)

In my first draft of the present series, the laboratory reports recorded 51 per cent of gland dysplasia. In order to test the accuracy of this finding, I reviewed the biopsy sections in the entire series and found the actual figure to be 81 per cent of dysplasia, many of the original diagnoses requiring correction. In this work I was assisted by Dr. George V. Smith, in order that the error of personal equation might be avoided.

An analysis was then made of the remaining 19 per cent (46 cases) in which gland dysplasia was absent. Six of these cases can be discarded on account of the presence of mucous or myomatous polyps which had probably provoked accidental and not dysfunctional bleed-

ing. In 16 cases the endometrium was atrophic or too fragmentary for accurate diagnosis, most of the patients having passed the menopause. Several had had previous irradiation. These cases can also be discounted as not being entirely pertinent. Of the 24 remaining cases that showed a normal interval endometrium, 22 were of the periodic-menorrhagia or prolonged-menopause type. This left two cases of normal endometrium in the presence of typical functional metrorrhagia. One of these had had a recent therapeutic curettage, the biopsy from which was not available. In the other the curettings, though normal, were too scanty for satisfactory diagnosis.

The foregoing evidence, taken in conjunction with that from the two series of hysterectomy cases here reported, strongly supports the

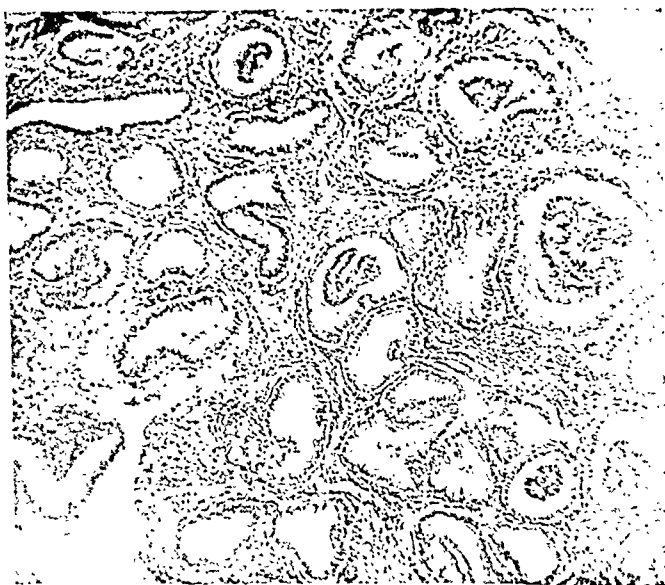


Fig. 7.—Gland dysplasia in the form of a general but uniform hypertrophy. The patient, thirty-two years of age, had periodic but profuse and prolonged menstruation. This appearance is sometimes mistaken for malignancy.

opinion that gland dysplasia is almost universally present in arrhythmic dysfunctional bleeding, and that it may or may not be present in the periodic menorrhagias.

(In this connection it should be stated that metrorrhagia appeared in the entire series in the ratio of about 56 to 60 per cent, the exact figure being undetermined on account of faulty details in some of the histories.)

* * * * *

III. The next subject of investigation was the relationship of fibroid tumors to dysfunctional bleeding. The preoperative examination notes of the 237 cases treated with radium revealed the presence of small fibroids in approximately 50 per cent of the entire number. Most of these tumors were evident; many were mentioned as suspected or probable. But careful study, both of the histories and of the endo-

metria, disclosed no clinical or histologic differences between the non-fibroid and the fibroid groups.

This observation supports the belief generally but not universally held that the abnormal bleeding associated with fibroids is identical in etiology and character with that of so-called idiopathic hemorrhage. The rule does not, however, apply to pedunculated fibroids, degenerating submucous fibroids and exposed uterine adenomyomata, conditions that require further study.

In order to gain additional information on the nature of the bleeding of fibroids, a study was next made of the uteri and ovaries of 25 patients subjected to hysterectomy and removal of the adnexa for large fibroid tumors. This group comprised cases with histories both

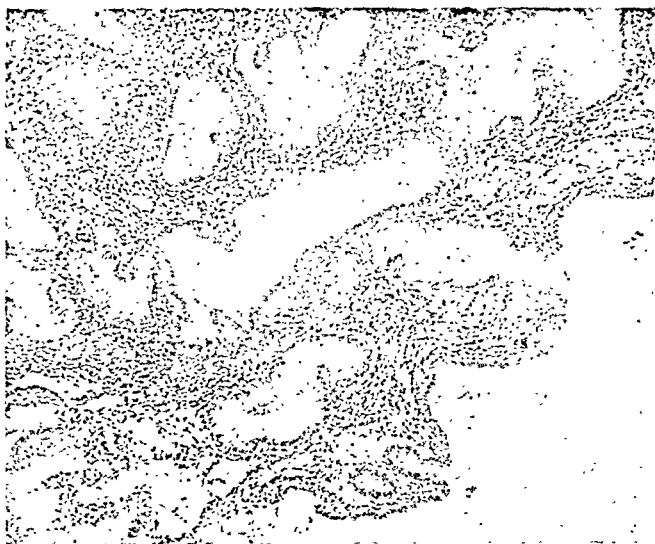


Fig. 8.—Gland dysplasia, showing moderate so-called dilatation of the glands. The picture is included in order to show that the widening of the glands is not a dilatation in the sense of an obstructive cystic retention, but rather, a true hypertrophy. No evidence of secretion can be seen, and in one place a dilated gland is shown with a distended, instead of a constricted or occluded, opening.

of normal and abnormal bleeding. It was hoped by this means to check up the histologic changes of the ovaries and endometrium associated with *metrorrhagia* with a parallel picture of what occurs during the normal menstrual cycle.

Abstracts of the several cases with the histories and histologic findings are given, together with a tabulation of the results.

LARGE FIBROID SERIES: DYSFUNCTIONAL BLEEDING

CASE 1.—J. C. Path. No. 17431. Age forty-four. Single. Menstruation: Regular, profuse. Last eta. 17 days. Endometrium: Normal early premenstrual stage. Ovaries: (One had been previously removed.) Fresh, young corpus luteum. Remains of old corpus luteum. Two follicle cysts. Myometrium: Large fibroids. Note: Normal physiology.

CASE 2.—E. H. Path. No. 17438. Age forty-four. Married, 2 children, 1 miscarriage. Menstruation: Regular, profuse. Last eta. 10 days. Endometrium:

Normal proliferative stage. Ovaries: Right, fresh corpus luteum. Old collapsed corpus luteum. Left, several follicle cysts. Myometrium: Multiple fibroids. Note: Normal physiology.

CASE 3.—E. L. Path. No. 17487. Age forty-one. Married, 3 children, 1 miscarriage. Menstruation: Normal. Last eta. 65 days. Pregnant. Endometrium: Decidua, early pregnancy. Ovaries: Right, corpus luteum of pregnancy. Left, no cystic follicles. Myometrium: Large fibroid. Note: Normal physiology. Pregnancy.

CASE 4.—A. H. Path. No. 17484. Age fifty. Married. Menstruation: Metrorrhagia, 2 months, continuous. Endometrium: Scattered areas of moderate dysplasia with superficial necrosis, adenomyosis. Ovaries: Right, no corpus luteum. No cystic follicles. Left, large dermoid cyst. No corpus luteum. Myometrium: Large fibroid with adenomyosis. Note: Normal physiology.

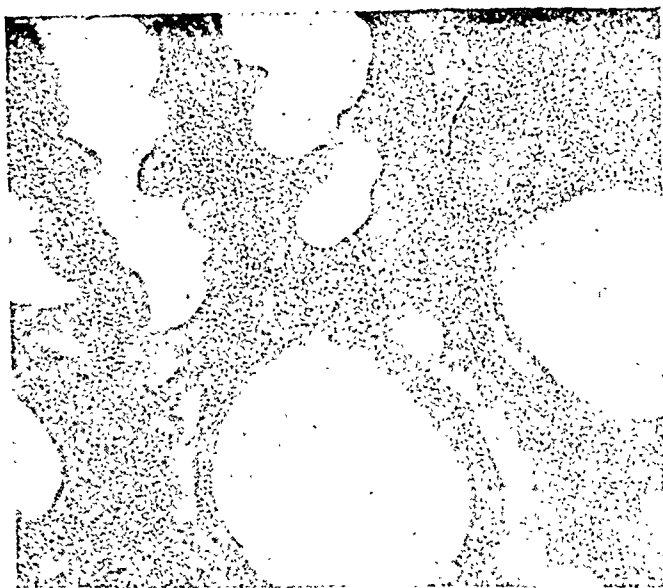


Fig. 9.—Gland dysplasia, showing wide dilatation of the glands in the form called by Novak the "swiss-cheese" type. This appearance is extremely characteristic and appears to a greater or less extent in most of the dysplastic endometria. The patient in this case was 43 years old and suffered from severe continuous metrorrhagia.

CASE 5.—J. C. Path. No. 17370. Age forty-eight. Married, 3 children, 1 miscarriage. Menstruation: 21- to 28-day cycle. Last eta. 15 days. Endometrium: Normal proliferative stage. Ovaries: Right, fragmentary; corpus luteum had been adherent and left in pelvis. Left, no corpus luteum. No cystic follicles. Myometrium: Multiple fibroids. Note: Normal physiology.

CASE 6.—M. L. Path. No. 14442. Age thirty-seven. Married, 5 children. Menstruation: Normal. Last eta. 11 days. Endometrium: Normal proliferative stage. Ovaries: Right, no corpus luteum. No cystic follicles. Left, fresh corpus luteum. One very small cystic follicle. Myometrium: Multiple fibroids. Note: Normal physiology.

CASE 7.—A. G. Path. No. 17057. Age forty-eight. Single. Menstruation: Menorrhagia, metrorrhagia. Skipping followed by constant metrorrhagia. Endometrium: Marked dysplasia. Adenomyosis showing the same type of glands. Ovaries: Right, small follicle cyst. No corpus luteum. Left, large follicle cyst. No corpus luteum. Myometrium: Large fibroids with adenomyosis. Note: Dysfunctional bleeding with typical histology.

CASE 8.—M. S. Path. No. 17457. Age thirty-three. Married, 1 child. Menstruation: Normal. Last eta. 20 days. Endometrium: Normal early premenstrual stage. Ovaries: Right, normal follicle atresia. Left, well-developed recent corpus luteum. Myometrium: Multiple fibroids. Note: Normal physiology.

CASE 9.—M. B. Path. No. 17117. Age forty-seven. Married. Menstruation: Menopause 14 months. Constant staining 2 months. Endometrium: Atrophy and dysplasia, with endometritis. Ovaries: Right, follicle cyst. Left, small serous cystoma. Myometrium: Large fibroid. Note: Postclimacteric dysfunctional bleeding, with characteristic changes.

CASE 10.—A. P. Path. No. 17141. Age forty-seven. Married. Menstruation: Normal. Last eta. 8 days. Endometrium: Normal early proliferating stage. Ovaries: Right, normal involuting corpus luteum (1½ cm.). 1 follicle cyst. Left, cystic follicle. Myometrium: Multiple fibroids. Note: Normal physiology.

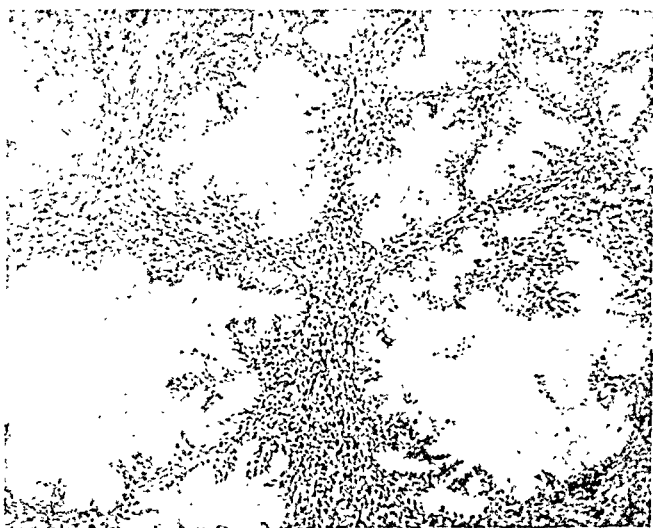


Fig. 10.—Gland dysplasia in a premenstrual endometrium. The glands are uniformly of the secretory type but show marked hypertrophy, evidently under the influence of, but not dominated by, a growth hormone. As would be expected from the picture, the patient (forty-five years of age) suffered from periodic menorrhagia. One would expect to find in the ovaries rhythmic but defective ovulation.

CASE 11.—R. W. Path. No. 17165. Age thirty-eight. Married, 3 children. Menstruation: Irregularly periodic: Menorrhagia. Last eta. 24 days. Endometrium: Premenstrual, mixed with proliferative, Swiss-cheese dysplasia. Ovaries: Right, several cystic follicles. One mature follicle with egg. Left, recent corpus luteum with thinned and flattened granulosa. Somewhat cystic. Myometrium: Large fibroid. Note: This case illustrates the effect of a defective corpus luteum, not sufficiently strong to counteract the follicle action.

CASE 12.—E. G. Path. No. 17173. Age thirty. Single. Menstruation: Periodic, profuse. Last eta. 21 days. Endometrium: Normal early premenstrual stage. Ovaries: Right, corpus luteum. Granulosa somewhat flattened. Several small cystic follicles. Left, numerous small cystic follicles. Myometrium: Large fibroid. Note: Slight deviation from normal.

CASE 13.—M. G. Path. No. 17203. Age forty-five. Married, 1 child. Menstruation: Metrorrhagia, constant for 1 year. Endometrium: Marked gland dysplasia. Proliferative. Swiss-cheese type. Ovaries: (One ovary removed 3 years before.) Large follicle cyst. No corpus luteum. Myometrium: Large fibroid. Note: Dysfunctional bleeding with typical histology.

CASE 14.—G. C. Path. No. 17229. Age forty-four. Married, 4 children. Menstruation: Normal. Last eta. 21 days. Endometrium: Normal premenstrual stage. Ovaries: Right, normal corpus luteum, a few atretic follicles. Left, a few atretic follicles. Myometrium: Multiple fibroids. Note: Normal physiology.

CASE 15.—E. C. Path. No. 17440. Age thirty-eight. Married. Menstruation: Normal. Last eta. 18 days. Endometrium: Normal proliferative stage. Ovaries: Right, matured corpus luteum, beginning fibrosis. Left, numerous active immature follicles. Some follicle atresia. One follicle evidently just after rupture. Myometrium: Multiple fibroid. Adenomyosis in one cornu. Note: Normal physiology just after ovulation.

CASE 16.—A. M. Path. No. 17239. Age forty-three. Married. Menstruation: Menorrhagia, 6 years. Metrorrhagia, 2 months. Endometrium: Typical gland dysplasia. Ovaries: Right, small. No cysts. No corpus luteum. Left, two large follicle cysts. No corpus luteum. Myometrium: Large fibroid. Note: Dysfunctional bleeding with typical histology.

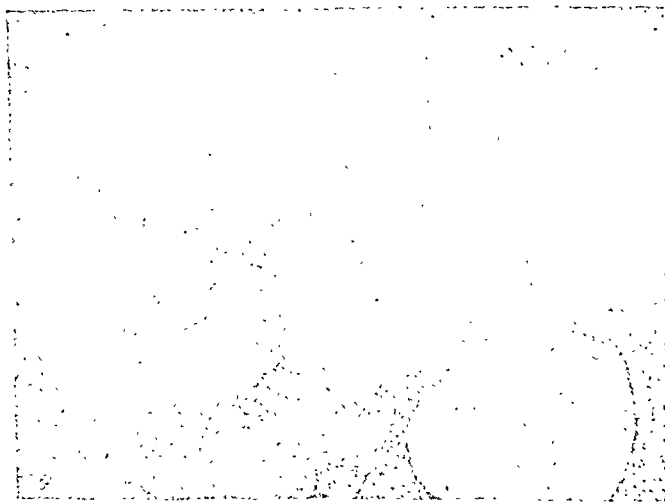


Fig. 11.—Dysplasia, postclimacteric. Endometrium from a patient of sixty-six years with nonmalignant bleeding. There was also an endometrial polyp present. The etiology in cases of this kind is problematic.

CASE 17.—L. E. Path. No. 17255. Age forty-seven. Married. Menstruation: Normal. Last eta. 19 days. Endometrium: Late proliferative stage, with slight dilatation. Ovaries: Right, no follicle cysts. Left, fresh corpus luteum. No follicle cysts. Myometrium: Leiomyosarcoma. Tubercular salpingitis. Note: Normal physiology in the presence of serious pelvic disease.

CASE 18.—B. F. Path. No. 17261. Age forty. Married. Menstruation: Normal. Last eta. 16 days. Endometrium: Normal proliferative stage. Ovaries: Right, no cysts. Left, fresh corpus luteum. No cysts. Myometrium: Large fibroid. Note: Normal physiology.

CASE 19.—J. W. Path. No. 17405. Age forty-five. Married, 1 child. Menstruation: Polymenorrhea, rhythmic, with severe menorrhagia. Last eta. 14 days. Endometrium: Premenstrual stage (note frequent periods). Ovaries: Right, follicle cyst. Left, corpus luteum cyst. Lutein cells disintegrating. Myometrium: Multiple fibroids, with adenomyosis. Note: Deviation from normal, with picture somewhat confused.

CASE 20.—A. G. Path. No. 17390. Age thirty-nine. Married, 1 child. Menstruation: Normal. Last eta. 27 days. Endometrium: Normal premenstrual stage. Ovaries: Right, ripe corpus luteum. No follicle cysts. Left, early maturing

graafian follicle. No cysts. Myometrium: Multiple fibroids. Note: Study this for perfect timing of endometrium, corpus luteum and young follicle.

CASE 21.—R. C. Path. No. 17035. Age forty-six. Married, 6 children, 2 miscarriages. Menstruation: Normal. Last eta. 21 days. Endometrium: Prolifera-

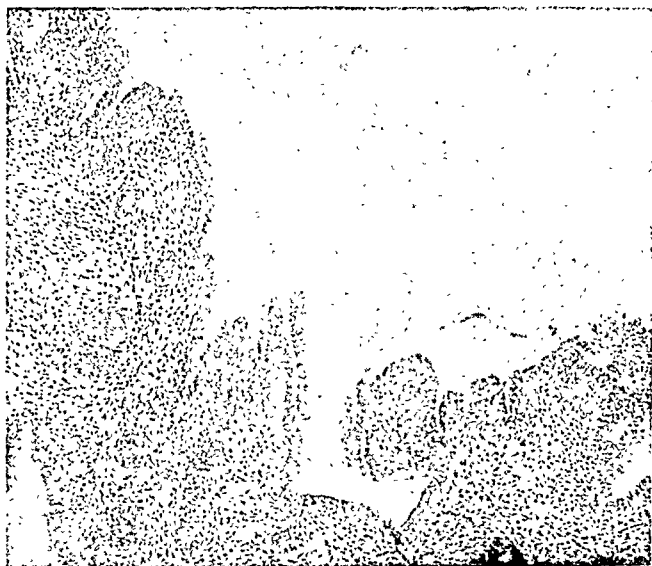


Fig. 12.—Gland dysplasia of mixed type. The picture shows marked polypoid hypertrophy of the stroma in which are seen glands in the rest stage. Other curettings from this same case showed swiss-cheese hyperplasia of the glands with little stroma. The patient, forty-eight years old, was treated for metrorrhagia.



Fig. 13.—Gland dysplasia in a girl of 24 years, with long-standing continuous metrorrhagia. The polypoid hypertrophy of the endometrium and "swiss-cheese" gland hyperplasia side by side with glands in the rest stage are depicted.

tive stage, with very early premenstrual changes. Ovaries: Right, normal follicle atresia. Left, fresh corpus luteum. No cysts. Myometrium: Large fibroid. Note: Normal physiology.

CASE 22.—C. C. Path. No. 17115. Age forty-eight. Single. Menstruation: Metrorrhagia, 2 years. (Record incomplete.) Endometrium: Atrophied. Ovaries: Right, numerous cystic follicles. No corpus luteum. Left, numerous cystic and hemorrhagic follicles. No corpus luteum. Myometrium: Large fibroid. Note: Probably case of postclimacteric dysfunctional bleeding. Gland dysplasia absent.

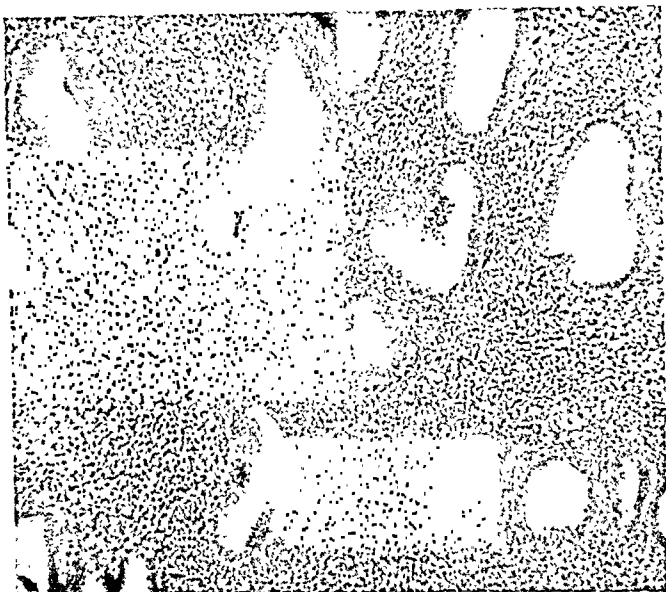


Fig. 14-A.—Gland dysplasia, mixed type. This picture shows a moderately hypertrophied endometrium of the proliferative stage. Its significance lies in its association with premenstrual changes seen in other sections (Fig. 14-B). The patient, forty years old, suffered from severe periodic menorrhagia.



Fig. 14-B.—Same as Fig. 14-A. Hypertrophied proliferative glands side by side with glands that show atypical premenstrual changes.

CASE 23.—C. L. Path. No. 17024. Age forty-seven. Married, 2 children. Menstruation: Metrorrhagia and skipping for 3 months. Endometrium: Typical gland dysplasia. Ovaries: Right, old disintegrating corpus luteum cyst. Left, no corpus luteum. No cystic follicles. Myometrium: Multiple fibroids. Note: Dysfunctional bleeding with typical histologic changes.

CASE 24.—B. B. Path. No. 17296. Age thirty-seven. Married, 1 child. Menstruation: Two periods previous month. Last eta. 30 days. Endometrium: Moderate dysplasia. Ovaries: Right, old degenerating corpus luteum. Large retention cyst. Left, several cystic follicles. Myometrium: Large fibroid. Note: Deviation from normal. Recent menstrual irregularity.



Fig. 15-A.—Gland dysplasia, mixed type, showing marked hypertrophy of the stroma associated with dilatation of the glands. Patient fifty years old, with severe metrorrhagia for eight weeks.



Fig. 15-B.—Same case as preceding figure. Mixed gland dysplasia, showing great irregularity and dilatation of glands. Slight evidences of secretory changes.

CASE 25.—R. H. Path. No. 17522. Age fifty-one. Married, 1 child. Menstruation: Normal, but last eta. 33 days. Endometrium: Partly normal premenstrual, partly proliferative, with slight dysplasia. Ovaries: Right, negative. Left, ripe corpus luteum. Granulosa cells infiltrated with blood. Myometrium: Multiple fibroids.

From a perusal of the foregoing abstracts it will be seen that of the 25 cases 14 had a history of normal menstruation, and in each of these was found an endometrium corresponding in its phase to the development of the corpus luteum, which was always consistent in age with the date of the preceding menstruation. The time of ovulation, however, varied, though in no case was it delayed beyond the seventeenth day. In one instance it had taken place by the eighth day, and in one by the eleventh day. This variation has been noted by others. One case, complicated by an early pregnancy, was included to emphasize still further that the ovaries and endometrium may functionate normally even in the presence of large fibroids.



Fig. 15-C.—Same case as two preceding figures, showing portion of endometrium with typical secretory or premenstrual changes in the glands. These three phases of the same endometrium illustrate the imbalance that exists between the two ovarian hormones when a corpus luteum is present but defective.

Besides the normally functioning cases, 4 with polymenorrhea and 7 with typical metrorrhagia were included. In all these 11 cases, gland dysplasia and aberrations in the development of the corpus luteum appeared, reproducing exactly the picture seen in the series of 18 cases first described, in which no fibroids were present.

The results of these studies lead to the conclusion that the bleeding of fibroid tumors (with the exceptions noted) is purely functional and in no way specific.

* * * * *

IV. An important factor in the problem of dysfunctional bleeding is the rôle played by the cystic follicles. In the typically metrorrhagic (i.e., arrhythmic) cases of the first and third groups, follicle cysts were always present. In the seminormal (polymenorrheic) cases they appeared in conjunction with defective corpora lutea. In the function-

LARGE FIBROID SERIES TABULATED

| CASE | AGE | COND. | PREG. | MENSTR. | LAST CTA. | OVARIES | | ENDOMETRIUM |
|------|-----|-------|-------|-----------|------------|---------------|-------------|----------------------|
| | | | | | | CORPUS LUTEUM | FOLL. CYSTS | |
| 1 | 44 | S | 0 | Normal | 17 days | Normal | Two | Early premenstrual |
| 2 | 44 | M | 3 | Normal | 10 days | Normal | Several | Proliferative |
| 3 | 41 | M | 4 | Normal | 65 days | Normal | None | Decidua of preg. |
| 4 | 50 | M | 0 | Metrorrh. | 2 mo. flow | Absent | Dermoid | Dysplasia |
| 5 | 48 | M | 4 | Irrg. | 15 days | Normal | None | Proliferative |
| 6 | 37 | M | 5 | Normal | 11 days | Normal | 1 small | Proliferative |
| 7 | 48 | S | 0 | Metrorrh. | Constant | Absent | 1 large | Dysplasia |
| 8 | 33 | M | 1 | Normal | 20 days | Normal | None | Premenstrual |
| 9 | 47 | M | 0 | Metrorrh. | 14 mo. | Absent | Two | Dysplasia-atrophy |
| 10 | 47 | M | 0 | Normal | 8 days | Normal | Two | Proliferative |
| 11 | 38 | M | 3 | Irrg. | 24 days | Defective | Several | Premenstr. & prolif. |
| 12 | 30 | S | 0 | Normal | 21 days | Normal | Several | Premenstrual |
| 13 | 45 | M | 1 | Metrorrh. | Constant | Absent | 1 large | Dysplasia |
| 14 | 44 | M | 4 | Normal | 21 days | Normal | None | Premenstrual |
| 15 | 38 | M | 0 | Normal | 18 days | Normal | None | Proliferative |
| 16 | 43 | M | 0 | Metrorrh. | Constant | Absent | 2 large | Dysplasia |
| 17 | 47 | M | 0 | Normal | 19 days | Normal | None | Proliferative |
| 18 | 40 | M | 0 | Normal | 16 days | Normal | None | Proliferative |
| 19 | 45 | M | 1 | Polymen. | 14 days | Cystic | One | Premenstrual |
| 20 | 39 | M | 1 | Normal | 28 days | Normal | None | Premenstrual |
| 21 | 46 | M | 8 | Normal | 21 days | Normal | None | Premenstrual |
| 22 | 48 | S | 0 | Metrorrh. | Constant | Absent | Numerous | Atrophied |
| 23 | 47 | M | 2 | Metrorrh. | 3 mo. | Cystic | None | Dysplasia |
| 24 | 37 | M | 1 | 1 irreg. | 30 days | Over-ripe | 1 large | Dysplasia—mild |
| 25 | 51 | M | 1 | Delayed | 33 days | Over-ripe | None | Dysplasia—slight |

ally normal cases they were often insignificant, often absent. According to Schroeder's creed, dysplasia of the endometrium with its consequent bleeding is produced by the accumulation of growth-hormone in the persisting follicles. Recent discoveries tend to modify this doctrine.

The younger persistent follicles in my series showed a rich granulosa lining, which was undoubtedly active. But the epithelium of the older follicle cysts in the long-standing cases appeared meager and was often absent entirely, so that the cysts gave the impression of inert organs.

In four cases where it was possible to secure fresh sterile material, the liquor from these older cysts was injected into spayed rats to determine its hormone potency, but each time without reaction. These experiments are too few in number for definite conclusions. They merely lend weight to a growing belief that the follicle cytolysis, gland dysplasia and failure of the corpus luteum are all incidental phenomena resulting from or intensified by the disturbance of some more powerful hormone higher up in the endocrine scale. Suggestive, also, are the cases of gland dysplasia, follicle cytolysis and bleeding that occur in patients after the menopause, where a motor impulse from the germ plasm is out of the question.

* * * * *

V. A study of the uterine blood in functional metrorrhagia was initiated by making a daily examination of the discharges from a girl of twenty-three with long-standing idiopathic hemorrhage. Later biopsy from curettage revealed a marked gland dysplasia. Microscopic examination of the uterine blood failed to show the characteristic endometrial remnants seen in normal menstruation. This single observation taken in conjunction with the nearly universal occurrence of clotting in our cases supports the conclusion, otherwise logical, that the blood of dysfunctional hemorrhage is deficient in, or entirely lacks, the secretory elements that would be induced by a normal corpus luteum. In other words, it approaches, or may be equivalent to, an ordinary body hemorrhage, according to the extent of the functional disturbance. This probably explains the severe and uncontrollable hemorrhages that are frequently encountered.

* * * * *

VI. The theory of the etiology of dysfunctional uterine hemorrhages advocated in this paper assumes a twofold hormone of the ovary. At the present day this assumption hardly needs confirmation. Dr. Smith of the Free Hospital for Women, working with Corner's lipoid extract of corpus luteum, has entirely substantiated Dr. Corner's well-known results. He has also discovered new evidence of the specificity of the corpus luteum hormone by demonstrating distinctive reactions in the blood chemistry of experimental animals under conditions of

ovulation, pregnancy and castration. This constitutes a new and apparently rich field of research. Dr. Smith will publish his observations in a later monograph.

SUMMARY

1. Metrorrhagia (arhythmic dysfunctional uterine bleeding) is associated with complete absence or marked defectiveness of the corpus luteum.

2. The bleeding of metrorrhagia is the result of localized necroses in a dysplastic endometrium.

3. Typical dysfunctional metrorrhagia is almost constantly associated with endometrial dysplasia.

4. Endometrial dysplasia is produced by the abnormal continuation of the unantagonized follicle hormone and is constantly associated with follicle cystosis. A possible influence from the anterior pituitary must be considered.

5. In *periodic* dysfunctional bleeding both the follicle and corpus luteum hormones are present, but in a state of physiologic imbalance. Gland dysplasia may or may not be present according to the extent of the disturbance.

6. The bleeding of fibroid tumors (with exceptions noted) is dysfunctional in nature and is morphologically and physiologically identical with that from nonfibroid uteri.

7. The specificity of the corpus luteum hormone in contrast to that of the follicle has been confirmed by Smith, first by a repetition of Corner's work, and secondly by the discovery of distinctive reactions in the blood chemistry of experimental animals under various sexual conditions.

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THE QUESTION OF POSSIBLE ENDOMETRIAL TRAUMA AND DISLOCATION ASSOCIATING UTEROTUBAL INSUFFLATION

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THE possibility of dislocating endometrial particles as a result of uterotubal insufflation must have occurred to many since Sampson's epochal reports on the pathology and etiology of endometriomata.¹ Although I have not encountered a single instance in which tubal insufflation caused peritoneal endometriomata it is well to inquire into the possibilities and probabilities. Sampson makes no mention of tubal insufflation in connection with his reported cases of endometriomata. Search of the recent medical literature shows that others have mentioned the etiologic relationship between them without, however, adducing evidence to support their hypothesis. It is the major purpose of this paper to discuss this question.

Two serious dangers engaged my attention at the onset. The first was that of introducing infection along with the gas into the peritoneal cavity via the tubes and the second was gas embolism. These have been dealt with in a number of publications. The contraindications to the performance of uterotubal insufflation have been repeatedly stated. They cannot be overemphasized. Briefly they are as follows: (1) the presence of infective secretions caused by Bartholinitis, urethritis, vaginitis, cervicitis; (2) bleeding from the genital tract; (3) inflammatory pelvic masses; (4) pelvic tenderness without palpable masses; (5) physiologic or pathologic pregnancy or suspicion of pregnancy. Scrupulous attention to these contraindications which were at first based upon general gynecologic experience and principles was considered sufficient to eliminate the danger of infection in practically all cases. Careful regard for points in technic further reduce possible bad results to a negligible minimum.

The significant record of 3000 cases examined by this method at the Woman's Hospital without a serious mishap as reported by George G. Ward points to its safety.² Similar results have been reported from Mt. Sinai Hospital and other American hospitals, too well known and numerous to mention in this brief communication, where this method has been properly employed.*

The effect of gas entering the venous circulation, an accident which might well be caused by traumatizing the uterine mucosa with the cannula, had already been estimated by an early experiment. Oxygen was introduced directly into the saphenous vein of a dog at a rate

*For some of the more important references see Rubin, *AM. JOUR. OBST. & GYNEC.* 17, No. 4, 484, April, 1929; also Anspach, Brooke, *AM. JOUR. OBST. AND GYNEC.*

flow which was employed in uterotubal insufflation. The amount of gas used was in excess of the quantity needed for clinical purposes. The animal tolerated the gas in the blood stream very well as the gas bubbles percolated into the vein under a minimum pressure, demonstrating that small bubbles are evidently taken up by the blood where they are distributed and absorbed by the erythrocytes without causing cardiac embarrassment. This single experiment added to the experience with intravenous oxygen therapy obtained during the late war, justified the conclusion that a small quantity of oxygen may be supported by the blood stream and that when administered slowly it does not give rise to embolism whether this be introduced into a peripheral vein or into the parenchymatous veins of an organ such as the uterus.

When however gas is forced under great pressure into the uterine veins through a traumatized endometrium, acute cardiac dilatation and collapse may result. This has actually happened resulting in death in a case which has come to my notice and which I have reported after investigating the circumstances.* The cervix and uterine mucosa in this case were first traumatized by cervical dilatation and curettage. This operation was then followed by uterotubal insufflation under high pressure. The patient had previously had an amputation of the cervix and at the time the uterus was insufflated there were present multiple fibroids and bilateral pyosalpinx. The avenues of entry being laid widely bare, the gas entered the venous circulation forcibly and in large quantity. The patient did not recover from the anesthesia. At the postmortem, large collections of oxygen were found in the iliac veins and inferior vena cava, as well as in the right heart. It is extremely doubtful if this tragic outcome would have occurred unless the oxygen was retained within the uterine cavity and the tubes in large volume. In that instance the curettage must have immediately followed the insufflation. The reverse order, i.e., curettage followed by the insufflation as testified to by the assistants present, would more logically explain the death.

This tragic experience has served to illustrate the extreme effects of forcible injection of gas in the presence of ruptured blood vessels.

In my early experiments upon extirpated uteri I was struck by the fact that the gas in a few instances escaped through the uterine veins. Upon examining the specimens carefully it was noted that the mucosa had been seriously injured during hysterectomy and that the uterus was roughly handled and squeezed. When care was exercised in the removal of the uterus, the uterine mucosa being left intact, leakage

*Case later mentioned by Moench in the J. A. M. A., Aug. 13, 1927. My investigation of this case resulted in different findings. The doctor who performed the operation had stated that he dilated and curetted after insufflating the uterus. It will only suffice to point out this error in judgment by calling attention to the fact that when the insufflation demonstrated closed tubes he proceeded nevertheless to do a curettage. The spectators present at the operation asserted that the curettage preceded the insufflation which is more likely, because had the curettage followed the insufflation by a few minutes no such calamity would have occurred.

through the vessels did not occur when gas was insufflated into the extirpated uterus. This gross trauma is of course not to be considered in the clinical performance of uterotubal insufflation.

Sampson has shown that during menstruation it is possible to force opaque material such as barium sulphate or bismuth in suspension into the "receiving" venous sinuses. *In the nonmenstruating state this cannot be done as the intact endometrium protects the veins.* The latter are naturally laid open during the menstrual desiccation. Sampson's radiographic pictures demonstrate the difference between menstruating and nonmenstruating mucosae.³ The trauma of curettage increases the injury to the uterine venous sinuses to a marked degree. *Uterine insufflation should never be done after a curettage or in the presence of uterine bleeding.*

In one of my early cases an attack of syncope occurring as soon as the patient rose from the examining table may have been due to trauma to the mucosa and the blood vessels of the cervix. The uterine cannula used in that case had been hammered out of shape by the nurse when she attempted to clean it out before the insufflation. Apparently the mucous lining of the stenosed cervical canal in that case was traumatized and the gas probably entered the blood vessels under a pressure of 200 mm. Hg. The patient regained consciousness within three minutes and suffered no other consequence. This avoidable accident, however, serves to illustrate the effect of trauma, and indicates the necessity of gentleness in employing the test. A smooth, highly polished cannula is essential. Fainting is not an utterly rare occurrence in office practice and need not be associated with vessel trauma. But the possibility of a circulatory disturbance as a cause of syncope must be borne in mind. A genuine attack of epilepsy was evidently precipitated by an insufflation in one of my cases. No unusual features were noted during the examination. Nor was my attention called to her convulsive tendency in the history. Upon inquiry she said that she had fallen faint on the street and elsewhere. Her husband added information which left no question as to the epileptic nature of her seizure.

Attention has been called to the postmenstrual phase; i.e., the fourth to the seventh day after cessation of the period as the most desirable and most favorable time to do the insufflation.⁴ The mucosa is then regenerated; it is not yet swollen or succulent; it is relatively flat and the amount of mucosal secretion is minimal. The introduction of the cannula is not likely to be attended by injury to the mucosa in the postmenstrual phase because the spongy layer of the endometrium has not yet been fully developed. Furthermore, the gas is not likely to displace secretions from the uterine cavity into the tubes. This is in accord with Sampson's findings "that although the endometrium of the early part of the interval stage of the menstrual cycle is thin, it

offers complete protection against escape of material from the uterine cavity. Curet and this protection is removed exposing the sinuses."

Insufflation should be deferred when bleeding immediately follows an attempt to introduce a sound or cannula into the uterine cavity. In case a cervical stenosis is encountered it is necessary first to overcome the obstruction by dilatation. The insufflation can be left for a more suitable time. The indication for the performance of uterotubal insufflation is never so urgent as to warrant undue and unnecessary hazards. Since its purpose is to determine the presence or absence of tubal patency in a case of sterility of several years' standing, postponing the test for another month or two cannot be of vital importance.

The finding of fragments of endometrium within the tube lumen has been regarded as strong evidence in favor of the mechanical transportation of these particles in retrograde fashion via the tubes from their source of origin to the peritoneal cavity where they may be deposited, become implanted, and develop into chocolate cysts.

In his later papers Sampson speaks of finding bits of endometrial tissue in the lumen of some of the tubes from whose fimbriated end *menstrual blood* was found to escape.⁵ This was observed in patients operated upon during menstruation. Microscopic particles of uterine mucosa have been demonstrated within the fallopian tubes during the menstrual interval by a few observers. H. O. Neumann⁶ has more recently reported upon three cases in which endometrium was demonstrable within the tube lumen. The fragments in two cases measured 1.5 : 1.0 : 0.6 mm. and 2.1 : 1.2 : 0.7 mm. These were not associated with endometriomata of the ovaries or of the peritoneal cavity. In the third cases masses of endometrial tissue were so voluminous lining the tube lumen as to resemble uterine mucosa. Sampson cysts were present on the same side. This author leaves open the question whether the fragments were freshly dislocated bits of uterine mucosa or whether they may have arisen through a heteroplasia of tubal epithelium. In none of these cases was mention made of tubal insufflation having preceded the operative removal of the tubes. Nevertheless on the basis of these three cases, among other conclusions, he ventures one that "the indications for tubal insufflation be restricted to a minimum and that hysterosalpingography be discarded altogether."⁶

Heim⁷ reported finding an endometrial fragment 1.4 : 0.6 mm. in the midportion of a fallopian tube which he explained as caused by the uterine clamp squeezing the delicate mucosa and breaking off pieces which were pressed through the uterine ostia into the tubes. Neumann in accepting this explanation remarks that under persistent pressure of the uterine clamp the uterine muscle relaxes and consequently the intramural portion of the tube becomes wider. After investigating a larger number of extirpated tubes he has found that viable endometrial particles are not uncommon in the tubes. "All it requires is careful serial section of the tubes." He further warns against squeezing the uterus in conservative operations and points out that endometrial dislocation can result when the patient is examined several times under narcosis.

There can be no doubt that it should be possible experimentally to dislocate detached endometrial particles from the uterine cavity into the tubal lumen. Theoretically it should also be possible to displace

by uterotubal insufflation particles of desiccated menstrual mucosa through the tubes into the peritoneal cavity. I have felt that retrograde transportation through the tubes can take place during a curettage.⁸ When vigorous uterine colic takes place the curette or irrigating uterine cannula can act as a stopper in the cervical canal. Irrigation might force these particles through the uterine ostiae of the tubes if care is not taken to withdraw the irrigator sufficiently often to allow for free escape of the irrigating fluid through the cervix. Koëmak⁹ has shown that this can occur and I have reported a similar observation.¹⁰ It would be of interest to note in how many cases of endometriosis one or more curettages may have been done previous to the operative findings of ectopic endometrial tissue and further whether irrigation had been used during the curettage. The use of irrigation has been abandoned by most gynecologists in the past decade. The operation of curettage, however, is often done by the general practitioner.

Experimental proof of the correctness of these claims might be obtained through systematic examinations of tubes removed at operation. The following plan for such a study suggests itself: 1. The uterus should be handled so as to avoid possible injury of the endometrium. If for technical reasons it must be grasped by uterine clamps or bullet forceps the tubes should first be clamped off at the interstitial portion. A control series of (a) curettements preliminary to the hysterectomy; (b) insufflation preliminary to the hysterectomy could be compared when, (1) the ordinary technic of hysterectomy is employed, and (2) when the tubes are clamped off first at their uterine junction before the uterus is grasped by any instrument; (3) clamping of only one tube in this way would still further control escape of endometrium into the unclamped tube. The amount of laboratory work entailed in such a task is obviously enormous, but when carried out would finally settle the question of mechanical dislodgment of endometrial particles.

I am in accord with Sampson in the theory that under certain conditions during menses endometrial particles can escape into the tubes. A well-marked cervical stenosis with hyperanteflexion can well form the predisposing basis of such an occurrence. That retrograde peristalsis takes place in the tubes was demonstrated by Wislocki and Guttmacher¹¹ and I have been able to confirm their observations both in animal experiments and with Bendick by clinical fluoroscopic examinations using lipiodol as the radio-opaque substance.^{12, 13} The escape of blood from the fimbriated end of the tubes as observed by Sampson during menstruation is strongly suggestive of a back flow. The theory of independent tubal menstruation still remains a debated point. If the latter were true it would incidentally explain epithelial dislocation toward the peritoneum.

Whether or not the desquamated menstruating endometrial particles can take root in the serosa of the genitals or peritoneal lining of the pelvis is still open to question. Sampson believes that "endometrial tissue disseminated by menstruation is sometimes alive and will continue to grow, if transferred to situations suited to its growth."³ He is convinced that the back flow of menstrual blood from the uterine cavity through the tubes is at least one of the important sources of the epithelium which results in peritoneal endometriosis. Jacobson¹⁴ succeeded in producing peritoneal endometriosis by implanting small pieces of endometrial tissue (not of the menstrual phase) into rabbits and monkeys. Heim,⁷ Caffier,¹⁵ and Katz and Szenes¹⁶ have moreover shown that such bits of viable endometrium may continue to grow in plasma culture in vitro. (The endometrial particles removed with the uterine cannula tip, presently to be described, may be utilized in the future for implantation and explantation experiments.) That epithelial débris contained in the menstrual blood is also capable of producing endometriomata still awaits experimental proof.

For endometrial dislocation to take place as a result of uterotubal insufflation one must assume the demonstrable presence of two conditions. 1. The uterine mucosa must be friable enough to be broken up into small particles by the cannula. 2. These particles must be demonstrated to be blown by the gas through the uterine ostia of the tubes. During observations made with the hysteroscope, using CO₂ for the insufflation, no such conditions were found.¹⁰ The instrument used for this purpose requires no preliminary dilatation of the cervix.* The endometrium of the postmenstrual phase is not fragile or friable. Particles of mucosa were not seen to float loosely in the uterine cavity. It is purely a matter of speculation whether a chance bit of endometrium that might be broken loose by the uterine cannula might be of the exact size and carried in the right direction toward the tubes to actually make its way into them.

When the tip of the uterine cannula is examined after its withdrawal from the uterus it shows that in a certain number of cases a very small particle or several tiny particles of uterine mucosa are removed at the same time. These minute particles are found in the lumen of the tip of the cannula and in the small fenestra into which they have apparently been pressed. They may be removed from the cannula tip by attaching a rubber bulb to its distal end and washing through it. Simply blowing air through the cannula will not remove the particles as they adhere tenaciously to the metal. Several attempts may be found necessary to finally clean the cannula of the mucus and mucosal particles. This maneuver in itself demonstrates

*Mikulicz-Radecki in a personal communication states that with the use of his hysteroscope which requires preliminary dilatation and water irrigation, fragments of mucosa are torn off in an appreciable number of cases.

the unlikelihood of the gas displacing these particles from the cannula into the uterine cavity during uterotubal insufflation.

STUDY OF THE BITS OF MUCOSA REMOVED WITH THE UTERINE CANNULA

For purposes of study the particles are first dislodged into cold water. Formalin is then added to the desired strength. Microscopic study of these minute particles which, blocked en masse and making at most a very small specimen for microscopic section has nevertheless enabled us to get some idea of the amount of trauma to the endometrium incidental to uterotubal insufflation. The material obtained in this way has also been studied in connection with the question of the morphological relationship between the ovarian and endometrial cycle.

The particles of mucosa were examined from 90 cases. In 43 instances no tissue was obtained for laboratory purposes. In 47 instances one or several tiny fragments have been available for microscopic study. Of the 90 cases of sterility in which tubal insufflation was done 65 cases were of women who menstruated normally and 25 were of women who had varying periods of delayed menstruation. The amount of tissue from the amenorrhea cases was more apt to be scantier than from those with regular menstruation.



Fig. 1.—A tiny fragment of squamous epithelium with a cervix gland.

SUMMARY OF THE FINDINGS OF THE TYPE GLAND, CERVIX OR CORPUS

In 5 cases there were fragments of squamous epithelium and a few cervix glands or fragments of cervix glands (Fig. 1).

In 8 cases there were cervical glands or fragments of cervix glands with mucus détritüs and small bits of stroma (Figs. 2 and 3).

Sixteen specimens showed cervix glands and endometrial glands or fragments of endometrial glands (Figs. 2 and 3). Seventeen specimens showed small numbers of endometrial glands with mucus détritüs (Fig. 4). In one specimen only a small collection of stroma cells were seen and no glands (Fig. 5).

The following experiments have also yielded data bearing on the question of possible endometrial dislocation during uterotubal insufflation:

1. Before removing the cannula at the end of clinical insufflation the gas valve is shut. The rubber tubing near its connection with the cannula is squeezed between the fingers so as to maintain the same pressure within the tubing which was reached during the insufflation. The cannula is then inserted into a water bottle and the pressure of the fingers is released. It is carefully noted whether mucus or mucosal particles are thus expelled into the solution. Ejection of the particles by this

maneuver has not been observed. At most there is partial displacement from the lumen of the cannula but the particles are not completely extruded.

2. Another way of observing whether the particles are displaced by the streaming gas is to release the pressure within the cannula and reducing it to zero by opening the needle valve before its removal from the uterus. When the uterine

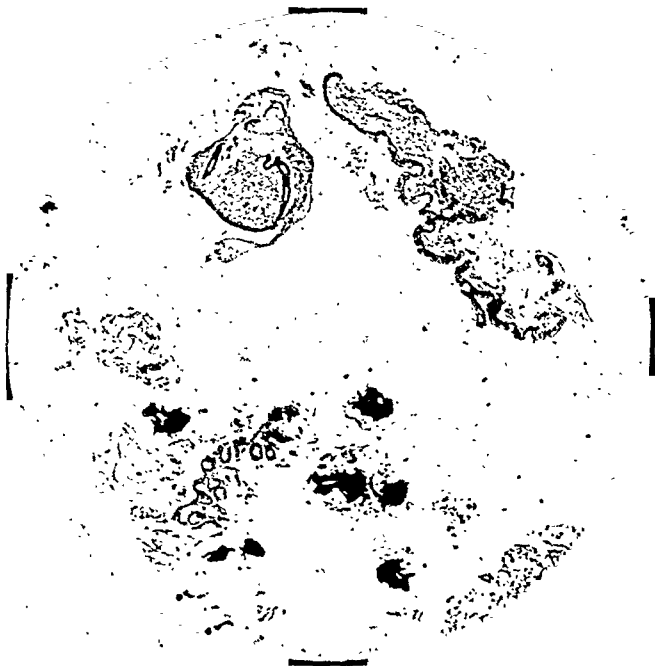


Fig. 2.—Cervix glands and endometrial glands with mucous detritus and small bits of stroma.



Fig. 3.—Cervix glands and endometrial fragments.

cannula has been removed from the uterus the needle valve is then closed, the rubber tubing is pinched and the pressure is raised to 200 mm. Hg. Then it is suddenly released so that any escape of particles from the cannula can be immediately discovered. This however is very rare. *Considerably more than 200 mm. Hg gas pressure is needed to displace it.* This is accomplished by the hand bulb and solution, the pressure being in excess of 200 mm. Hg. While contained in the uterine cannula the particles of mucosa and mucus moreover offer no barrier to

the steady flow of the gas as can be seen by the pressure dropping to zero the moment the cannula is removed from the uterus. The gas is seen to pass freely through the cannula tip.

In other words the particles are not sufficient in size to obstruct the lumen of the uterine cannula and therefore allow gas to pass alongside them. The tenacious property to mucus besides makes displacement of particles unlikely. When the intrauterine and intratubal pressure reaches 200 mm. Hg the tubes are either sealed altogether or are the seat of high grade stricture. In closed tubes, peritoneal endometriosis as a result of uterotubal insufflation is naturally out of the question.

Transportation via the lymph channels in the sense of the Halban theory¹⁷ may be considered purely hypothetical in connection with tubal insufflation.



Fig. 4.—Endometrial fragments with mucous detritus.



Fig. 5.—Tiny fragments of stoma cells.

Radiographic pictures obtained after injecting lipiodol into the uterine cavity in over 100 personal cases of tubal obstruction have also proved most valuable in this connection. Except in pathologic conditions as in myomata there is no evidence of blood vessel or lymph channel infiltration by the injected fluid. In none of the other cases comprising the vast majority was there evidence of lipiodol within the "receiving sinuses" in the uterine wall.^{18, 19}

CONCLUSIONS

Numerous observations on the clinical use of uterotubal insufflation point to the unlikelihood of endometrial displacement into the tubes and through them into the peritoneal cavity. This presupposes that the method is performed properly and that the mucosa is intact before the uterine cannula is introduced.

Observations of the tiny mucosal particles removed by the uterine cannula and experiments with them in situ within the cannula tip point to the unlikelihood of endometrial dislocation toward the peritoneal cavity.

Gross endometrial trauma as that attending curettage should never be immediately followed by uterotubal insufflation because of an inherently grave danger of gas embolism and of the possibility of dislodging mucosal fragments and blood into the peritoneum. This applies also to menstruation and the presence of abnormal bleeding from the uterus. The amount of endometrial trauma attending the properly indicated and properly performed insufflation at the most favorable time with reference to the menstrual cycle may be said to be negligible.

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911 PARK AVENUE.

POSTOPERATIVE OBSTETRIC EMBOLUS—ITS INCIDENCE, CAUSE AND PREVENTION

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A STUDY of the end-results of surgery within the abdomen or pelvis will usually disclose a certain number of tragic, sudden deaths due to embolism. Odd as it may seem, operations above the diaphragm and below the pelvis are less frequently provocative of embolic death than those abdominal and pelvic procedures which implicate the pampiniform and hemorrhoidal plexuses. Lister states that abdominal incision strongly predisposes to embolism, it matters not what the ultimate object of the operation, and statistics show that thrombosis and embolism are more common in gynecologic and obstetric practice than in other branches of surgery.

In 1712 abdominal hysterectomies at the Mayo Clinic there were five cases of fatal embolism, an incidence of one in 342 cases. In our clinic, in 6266 gynecologic operations there were thirteen fatalities from embolism, an incidence of one in 482.

Morton expresses the view that the special factor concerned is *infection* with a nonhemolytic streptococcus which normally inhabits the female genital tract. In support of infection as a predisposing cause there was a postoperative morbidity of 100 per cent in the cases which make up the basis of this report. Petren's figures which include an analysis of 496 fatal postoperative emboli show that 404 followed abdominal operations upon the uterus, ovaries, appendix and intestines. Strangulated herniae, myomata and pedicle torsions predispose to embolism. No surgical tragedy is so sudden or unexplainable as death from this cause.

ETIOLOGY

The mystery connected with the etiology of thrombosis and embolism makes the subject of great interest to the surgeon. Almost all observers speak of continued blood loss, infection and the consequent change in the blood picture following operation as predisposing causes of embolism. *It is probable that in every surgical patient there is a definitely increased potentiality for intravascular coagulation, from the increase of the blood platelets and leucocytes.* To prove the truth of this statement, Allen of the Mayo Clinic studied the changes in the blood following operation, arguing that since an embolus is a piece of clot dislodged from the tail of a thrombus at some distant location,

attention should be directed toward the mechanism of blood clotting and the factors that might participate in the formation of a clot within a vein following operation. In his summary he notes a constant increase in fibrinogen and a postoperative increase in the number of leucocytes. *Leucocytes are known to furnish thromboplastic substances* which play an important part in the coagulation of the blood; furthermore, there is a sharp prolongation of the prothrombin time which is important, though its significance is obscure, as well as an increase in the number of erythrocytes and the lipoids. Though his study is based on but a small number of cases, it is apparent that *these changes in the blood in response to operation are constant*, and that this non-specific physiologic response definitely increases the potentialities for

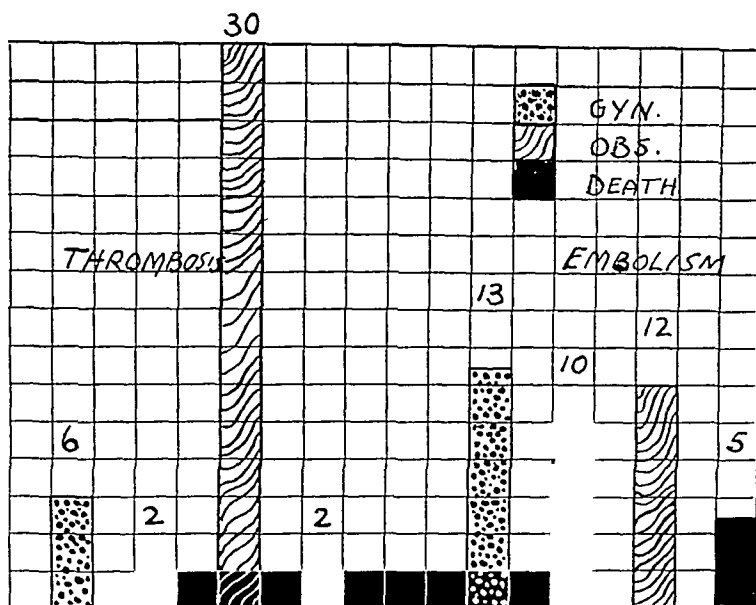


Fig. 1.—Comparative study of cases of thrombosis and embolism in obstetric and gynecologic cases, with mortalities.

intravascular coagulation, hence, may be accepted as a contributing factor. Adding to this the fact that postoperative cases always show some fall in blood pressure with consequent slowing of the blood stream, we have sufficient cause for clot formation. Postoperative thrombosis is a surgical entity which is all too frequent in pelvic operations and may cause pulmonary embolus in the parenchyma of the lung. Fifty per cent of postoperative pulmonary emboli have their source in thrombi of the femoral and iliac veins.

Acshoff describes five types of thrombosis, each of which may occur in gynecologic and obstetric practice:

- (1) Spontaneous (static large veins).
- (2) Traumatic (consequent upon ligation or compression of vessels).

- (3) Capillary (thrombosis as in transfusions).
- (4) Toxic (such as occur in the injections of salvarsan, mercuric, or arsenical poisoning).
- (5) Endogenous thrombosis (such as occurs in eclampsia).

Thrombosis, because it leads to fatal emboli of the pulmonary artery, represents the most serious complication in abdominal and gynecologic operations. The more we try to obviate the dangerous complications

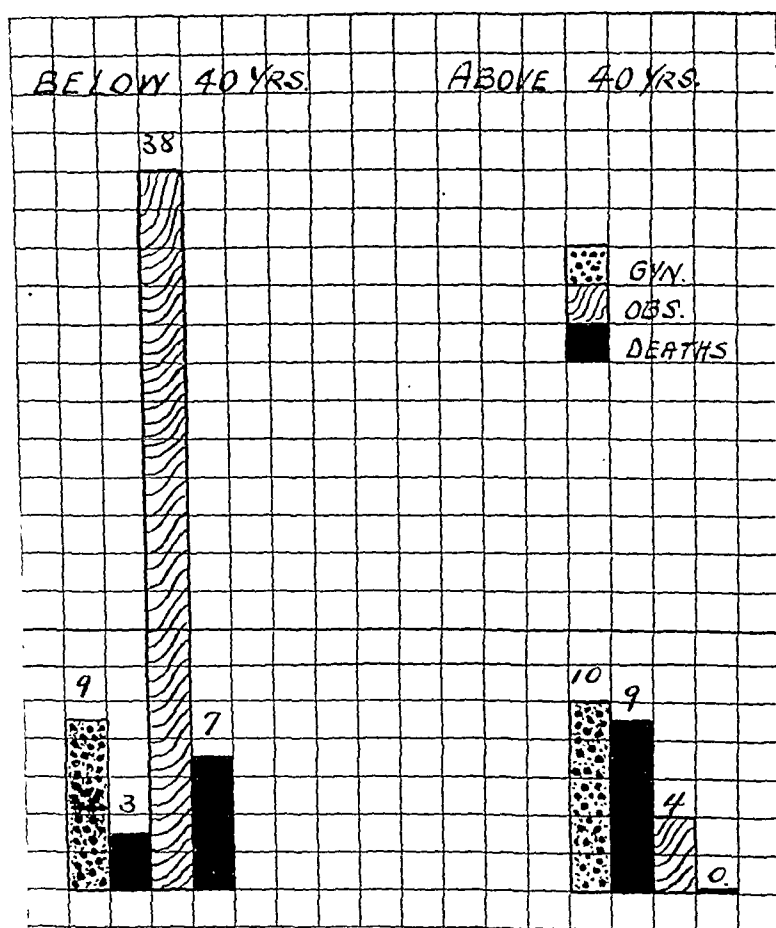


Fig. 2.—Comparative study of cases of thrombosis and embolism with deaths in patients below and above forty years of age.

of embolism the more urgent is our obligation to find out the cause of thrombosis. Mathematically speaking, thrombosis is the function of a number of variables; there is not a single cause, but quite a number of different conditions which are closely related to the occurrence of thrombosis. Among these may be mentioned:

- (1) Change in the blood plasma (diminished or increased coagulation).
- (2) Changes in the blood elements, resulting in diminished or increased powers in agglutination.

- (3) Changes in the blood flow (slowing of the circulation forms eddies which allow the platelets and white blood cells to linger in the periphery vessel where the stream is the slowest—these lay down on the endothelium, a white coagulum from which the thrombus starts).
- (4) Changes in the vessel wall itself (endothelial damage).

An analysis of the mechanism of thrombosis shows that sometimes one factor and sometimes another plays the principal rôle. If slowing of the blood stream and alteration of the condition of the platelets are to figure as the direct factors in thrombus formation, we must then consider as indirect factors, changes in the vessel wall, alteration in the cardiac action, and the loss of blood with lowering of blood pressure during and following operation.

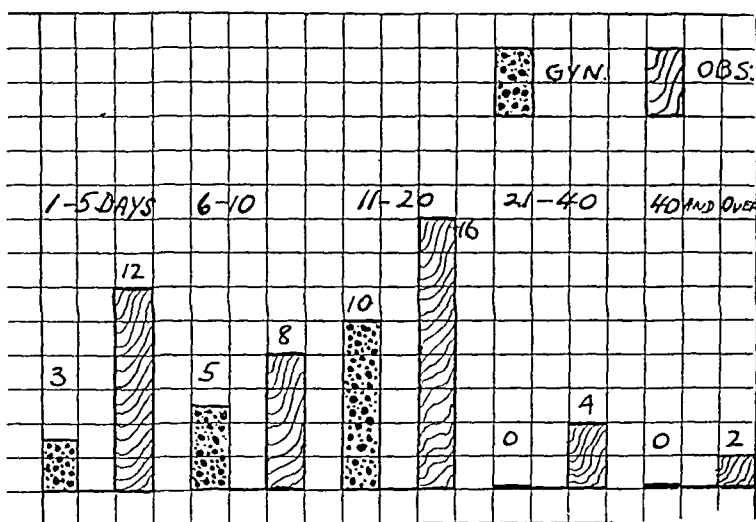


Fig. 3.—Chronologic occurrences of symptoms in 61 cases of thrombosis and embolism.

Snell noted the high incidence of pulmonary embolism in the obese patient who has been subjected to an abdominal operation. Obesity is always a factor in the fifth and sixth decades of life; likewise, obesity tends to make the operation more difficult. There is greater trauma, while mild circulatory failure with resultant venous stasis is more common. Finally, in the obese patient there is a diminished amount of antithrombin. It has been observed that operations in obese women due to the extensive areas of fat which are invaded cause an increased liberation of thromboplastic lipoid substances, such as kephalin and necessarily favor fat embolism.

In a recent paper, Walters shows that many physiologic changes and adjustments follow every surgical procedure. Those which seem to favor the formation of postoperative thrombosis and pulmonary emboli are:

- (1) Decrease in the metabolic activities.
- (2) Decrease in the rate of blood flow with decrease in blood pressure.
- (3) Changes in the cellular constituents of the blood (increase of platelets and leucocytes).

These conditions may be the result of rest in bed without food, interference with the circulation by intraabdominal manipulation and the forty-eight hours of intestinal quiet and muscular splinting of the abdominal wall which follow abdominal celiotomy. These views in the main coincide with the observations of Acschhoff and are more or less confirmed by the clinical study of the authors.

All clinical observers admit that pulmonary embolism is more common in pelvic operations, and in women who are forty or more, who are overweight, inactive and have relatively low pressures; and in subjects in whom there is some degree of postoperative infection, however mild. On the other hand, it has been noted that postoperative

| | | |
|--------------|----|--------|
| LEUCOPENIA | 10 | 52.6 % |
| HYPERTENSION | 7 | 37 % |
| ALBUMINURIA | 7 | 37 % |

Fig. 4.—Predominating findings in nineteen gynecologic cases of thrombosis and embolism.

| | | |
|--------------|----|--------|
| ANEMIA | 25 | 59.5 % |
| ALBUMINURIA | 19 | 45 % |
| HYPERTENSION | 9 | 21.4 % |
| LEUCOPENIA | 6 | 14.2 % |
| HYPOTENSION | 6 | 14.2 % |

Fig. 5.—Predominating findings in forty-two obstetric cases of thrombosis and embolism.

embolism is uncommon in children, which is probably explained by their activity, age and circulation. Furthermore, Plummer states that in cases of hyperfunction of the thyroid gland, thrombosis and embolism never occur even when the disturbances of the blood from cardiac decompensation are extreme. Solomons calls attention to the great danger in pelvic operations upon women with large varicosities of the legs and thighs, which are only outward manifestations of the pathology which is present within the pelvis.

sion on the vessels of the parametrium, and have proved, at least to our satisfaction, that preoperative torsion distends the vessels, slows the circulation, favors thrombus formation and results in a hypertrophy and hyperplasia of the contiguous tissues.*

In an attempt to clarify and systematize our knowledge we have studied the records of twelve thousand gynecologic and obstetric patients to determine: *first*, the incidence of thrombosis and embolism; *second*, the contributing causes, and finally, we have attempted to draw some conclusions which may be of clinical value.

In this study there were 6,266 women on whom pelvic operations were performed, with 19 cases of thrombosis and embolism, an incidence of 0.3. Among the 5,734 obstetric patients there were 42 cases of thrombosis and embolism, an incidence of 0.72; a total of 61 in 12,000 cases with a gross percentage incidence of 0.5. More detailed

| | | |
|----------------|---|-------|
| FIBROIDS | 7 | 36.8% |
| APPENDICITIS | 4 | 21% |
| OVARIAN CYST | 3 | 15.7% |
| RETROVERSION | 3 | 15.7% |
| PROCIDENTIA | 1 | 5.2% |
| PELVIC ABSCESS | 1 | 5.2% |

Fig. 8.—Diagnosis in nineteen gynecologic cases of thrombosis and embolism.

study shows that embolism is more common than thrombosis following gynecologic operations, while thrombosis is more frequent in obstetric deliveries, the percentage of embolism in the gynecologic cases being 68 per cent against 29 per cent in the obstetric group. (Table I.) Again, our study shows that the mortality in gynecologic cases resulting from embolism is nearly twice as great as that resulting from embolism occurring in the obstetric patient. Morbidity was a constant factor, being present in the 19 cases which occurred following gynecologic operations, and in the 42 which followed obstetric deliveries.

It is but natural that there are more women below forty who bear children than after forty, hence, there is a greater incidence of obstetric than gynecologic cases with thrombosis below this period. On the

*The results of these studies will appear in a paper to be published subsequently in this JOURNAL.

TABLE I. COMPARATIVE INCIDENCE AND PERCENTAGE OF THROMBOSIS AND EMBOLISM IN 12,000 CASES

| SERVICE | CASES | EMBOLISM | | | | | | THROMBOSIS | | | | | |
|-------------|--------|----------|----------|------------|----------|------|----------|------------|----------|------------|----------|------|----------|
| | | NO. | PER CENT | RE-COVERED | PER CENT | DIED | PER CENT | NO. | PER CENT | RE-COVERED | PER CENT | DIED | PER CENT |
| Gynecologic | 6266 | 13 | 0.2 | 3 | 0.046 | 10 | 0.16 | 6 | 0.1 | 4 | 0.06 | 2 | 0.03 |
| Obstetric | 5734 | 12 | 0.2 | 7 | 0.116 | 5 | 0.08 | 30 | 0.5 | 28 | 0.49 | 2 | 0.03 |
| Total | 12,000 | 25 | 0.2 | 10 | 0.08 | 15 | 0.125 | 36 | 0.3 | 32 | 0.266 | 4 | 0.03 |

other hand, after forty, there is a marked increase in the gynecologic death rate from embolus, and this coincides with the observations of most authorities.

We further studied these cases as to the time of the appearance of the clinical symptoms of thrombosis and emboli, and found that the occurrence was earlier in the obstetric case. Routine blood and urine studies were done on all of these patients. The outstanding factors were anemia and albuminuria in the obstetric series; while leucopenia, hypertension and albuminuria were more constant in the gynecologic group. These findings seem to point to changes in the blood and circulation together with toxemia as contributing factors which aid intravascular clotting. In the twelve fatal cases occurring in the gynecologic service, 75 per cent had leucopenia. Hypotension was present in 41 per cent of the deaths. Wells states that in anaphylactic shock leucopenia and diminished coagulation time are present. In the presence of passive congestion of the liver we have a similar picture.

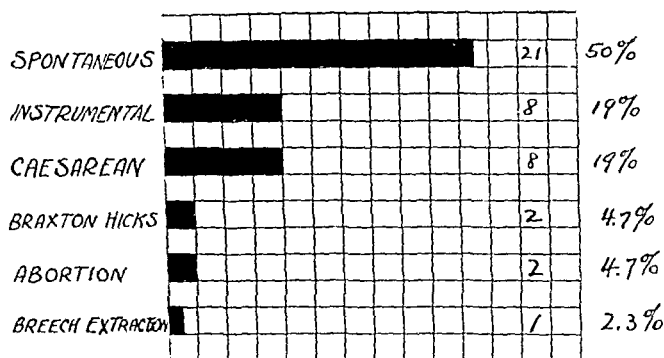


Fig. 9.—Procedure employed in forty-two obstetric cases of thrombosis and embolism.

Some have explained a diminished amount of antithrombin present in these conditions; hence, in the presence of hypotension with venous stasis, intravascular clotting may readily result, especially after the slightest degree of trauma or infection. In the obstetric group of fatalities, albuminuria, hypotension and anemia were rather constant and seemed to be important contributing factors. Again, in the 19 cases occurring in the gynecologic group, fibroids make up 36.8 per cent. The remainder of these cases were diagnosed as retroversion and ovarian cyst. It is a known fact clinically that these pathologic conditions are associated with torsion, varicosities and finally slowing of circulation; hence, venous stasis can also be considered a contributing factor. It is interesting to note that among the obstetric group in which there were 42 cases of thrombosis and embolism that 50 per cent occurred after spontaneous labor; all developed a morbidity and low grade infection. Two cases in this group had been transfused immediately before operation, the indication in each instance being pronounced chronic secondary anemia. Autopsy showed extensive

pulmonary embolism and blood casts in the kidney tubules. Is it possible that transfusion in such a case with cell changes induced, added to the biochemical changes which take place in the blood during anesthesia, precipitated embolism?

SUMMARY

1. The total incidence of thrombosis and embolism in 12,000 gynecologic and obstetric cases was found to be 0.5 per cent. The number of thrombosis in the obstetric group is double the number in the gynecologic. Embolism predominates after gynecologic operations, thrombosis in obstetric deliveries.

2. Thrombosis following operation is more liable to cause embolism than when it occurs following delivery.

3. Emboli following operation are more fatal than those following delivery.

4. The appearance of the clinical symptoms of thrombosis and embolism usually occurs between the second and third weeks, about the time when patients are allowed out of bed.

5. Mortality rate is higher in cases above forty years of age. In our series the number of cases above forty years of age is greater in gynecologic group.

6. Morbidity was found to be present in 100 per cent of cases; infection is therefore a factor which must be considered.

7. Obesity, hypotension, leucopenia, albuminuria, pregnancy, age, fibroids, anemia, toxemia—all predispose to venous stasis.

8. Experimentally, torsion leads to varicosities, stasis, and thrombosis with a generalized hyperplasia and hypertrophy of all contiguous tissues.

CONCLUSIONS

1. Venous stasis, the physiologic blood changes following operation, trauma, and infection, are the chief factors which predispose to thrombosis and embolism.

2. A more thorough preoperative study with detailed medical treatment of cases with hypotension, low basal metabolism, leucopenia, anemia and hypertension may lower the incidence.

3. As a prophylactic measure to diminish the occurrence of femoral thrombosis, besides asepsis and antisepsis, we must increase the metabolic activity and provide for the proper circulation of blood in the lower extremities. This can be accomplished by the employment of passive motion and the administration of thyroid extract before and following operation.

4. The subject of thrombosis and embolism is far from being settled and still remains an important problem for investigation.

FETAL MALFORMATIONS IN MULTIPLE PREGNANCY

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HUMAN and other twins have been studied by various investigators in an effort to gain more light on various problems associated with heredity. The importance and significance of such investigations have not been generally realized, especially by those who are active in the practice of obstetrics. They are in a peculiarly advantageous position for the study of some of these interesting and important questions which are related to human twinning. The obstetricians can observe the fetal changes associated with abortions, miscarriages and premature births and also those cases where one of the twins dies as a result of some defect of development or other affection.

It is usually possible to determine by an examination of the placenta and membranes whether the twins are monochorionic or dichorionic, which ordinarily means that the twins are monozygotic or dizygotic. This is not absolutely true as dizygotic twins may be monochorionic due to a fusion of the two sacs. The observation of the amnion is of importance as there may be only one in monozygotic though there are usually two. In instances of fused twins there is always only one amnion. It is of importance to examine carefully the placenta as a double or fused placenta speaks for dizygotic twins while a single placenta is often dizygotic. The cord is always double in dizygotic but may be more or less completely fused in monozygotic twins.

In looking over the reports of various interesting cases in the literature, and in checking the hospital records of some unusual conditions occurring in association with multiple pregnancy, one cannot help being struck with the incompleteness of the information regarding some of these points.

It is well known, of course, that duplicate or identical twins are always of the same sex and that fraternal may or may not correspond in this regard. Ratios and data given by Nichols and others and quoted by Newman indicate that the ratio of male twins, to mixed twins, to female twins is 1:1:1. If all were dizygotic, this proportion should be 1:2:1, with predetermined sex. This indicates, according to Newman, that "nearly half of all the same sexed twins are monozygotic and hence morphologically stand for but one individual to the pair." He is of the opinion that about one-fourth of all human twins are monozygotic.

This point could be pretty definitely settled by careful routine observation of placenta, membranes and cord. It is partly the lack of this information which has led Galton, Wilder, Siemens, Newman and others to set up schedules by which they seek to determine whether the twins are fraternal or identical. They have, of course, also been interested in determining of what the identity consists and how complete is the real duplication which may be symmetrical or of the image or mirror type.

On the basis of intrauterine data O. Schultze (according to Newman) divided twins into four categories which have been quoted by Wilder.

1. Twins with two blastodermic vesicles, two deciduous reflexae, and two placentae, which probably originate from two separate ova.

2. Twins with two separate blastodermic vesicles inclosed in a single decidua, but with two placentae and sets of umbilical vessels and with fused chorions. They apparently originate from two ova.

3. Twins with two amnions and two umbilical cords meeting near the center of a single placenta. They are enclosed in a single chorion and amnion. They are always of the same sex. Various possible explanations are offered and it is concluded as improbable that the duplicate twins would arise from an ovarian egg with two nuclei. It is suggested that the two probably arise from the complete separation of the two blastomeres which result from the first cleavage of the fertilized egg.

4. Twins resulting from conditions as above when the blastomeres are close together and a common amnion results and fused twins develop.

Newman is of the opinion that there are really only two types of human twins, the fraternal or dizygotic and the duplicate or monozygotic. He further believes that in humans twinning is variable and begins earlier in some than in others and becomes more complete. The double monsters are probably monozygotic twins in which the twinning process begins later than in separate twins and is never fully completed.

In making this presentation to the members of the American Gynecological Society, the main purpose is to make use of available information regarding malformations occurring in multiple pregnancies to determine the question whether fetal malformations are the result of conditions present in the ovum when fertilized, or the consequence of intrauterine environmental conditions.

Among 25,000 deliveries at the Chicago Lying-In Hospital there were 354 twin pregnancies, a ratio of about 1:70. Among these twins seven malformations are recorded which is a percentage of approximately 1.98. There were 568 listed deformities among the single pregnancies which yield a percentage of about 2.3. There would seem to be no material difference in the incidence of deformities in multiple and single pregnancies, at least not among those which go on to the period of viability.

Of these seven twins with malformations and other affections three may be considered as definitely dizygotic inasmuch as there was a double placenta in each case. Only one of the twins was affected in all of the instances.

CASE 1.—Mother para ii. Twin No. 1. Female, Weight 3810 grams. Alive. Twin No. 2. Sex not determined. Fetus papyraceous with its placenta. The degenerated fetus was surrounded by its complete membranes. The fetus itself showed some evidence of being a monster with a meningocele, spina bifida, and deformity of the head.

The placenta of the dead fetus was small, degenerated, and adjacent to but separated from the placenta of the living infant. (34749) Dichorionic.



Fig. 1.—Case 8. Shows deformed twin fetuses with a common sac.

CASE 2.—Mother (60912) para i. Twin No. 1 (61745) male, weight 1140 grams. An anencephalic monster with a spina bifida. There was a polyhydramnios of about two and one-half gallons. Twin No. 2 (61746) male, weight 1960 grams. There was a slight tongue tie but otherwise it was normal and survived. The placenta was double but fused, and there were two chorionic sacs. Dichorionic.

CASE 3.—Mother (73746) para iv. Twin No. 1, macerated fetus. Sex undetermined. Weight 345 grams. It was born before the mother entered the hospital. Its placenta was delivered before the birth of Twin No. 2, male, weight 2325 grams. Living. Dichorionic.

CASE 4.—Mother (22520) para i. Twin No. 1. Female, weight 2115 grams. Rudimentary left hand with thumb and some fingers missing. Twin No. 2, female, weight 1380 grams. A normal premature infant. The placenta was single with two separate cords. The records are not clear as to whether these were mono- or dichorionic twins.

CASE 5.—Mother (46276) para i. Age 21 years. Gestation 32 weeks. Twin No. 1. Female, weight 1180 grams. Lived 10 hours. A monster with a cephalo-

meningocele. Twin No. 2. Female, weight 1135 grams. Normal development but premature and lived seven hours. The placenta was single with two cords. The record does not establish whether or not these twins were mono- or dichorionic twins.

CASE 6.—Mother (61986) para i. Twin No. 1. Male, weight 2725 grams. Normal, lived. Twin No. 2. Male, stillborn and macerated. Hydrocephalic but an autopsy revealed no other malformations. Placenta was single with two cords. One portion of the placenta was degenerated. The record does not establish the character of the twins.

CASE 7.—Mother (66432) para iii. Twin No. 1. Female, weight 3050 grams. Diagnosed as Mongolian idiot. Lived. Twin No. 2. Female, weight 3655 grams. Normal, lived. Placenta and chorion not described.

There are also in my series eight other cases of malformations in twin pregnancies. These have been collected from various sources so that it is difficult to give any statistical data as to the percentage incidence of either the multiple pregnancies or the malformations.

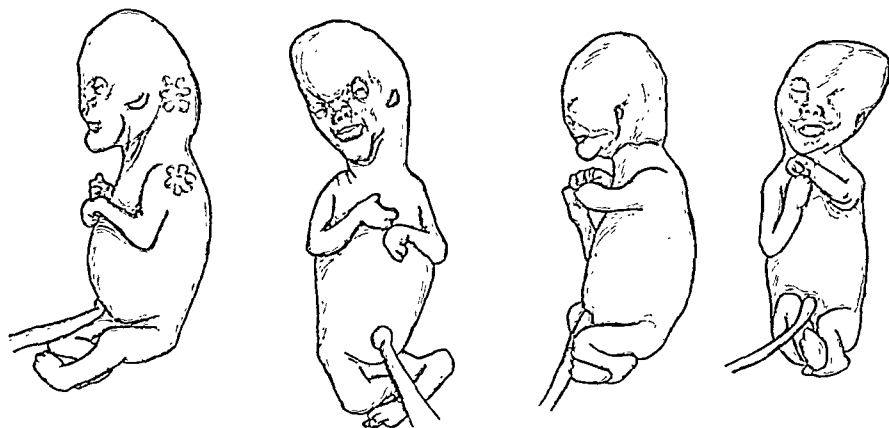


Fig. 2.—Case 8. Drawing made from the same fetuses to show similarity in deformities, especially of the face and extremities.

CASE 8.—Specimen from Dr. J. E. Hynes of Minneapolis.

Mother grav. i. Hyperemesis but no evidence of genital infection or tumors. Last menstruation Feb. 2, 1915. Spontaneous abortion on June 18, 1915. The twins were smaller than the menstrual age indicates. Twin pregnancy with similar deformities of both fetuses. The faces and extremities were both deformed in a similar manner; the similar loss of digits on the hands and feet of both fetuses being quite similar. Their crown rump measurements were 51 and 53.3 mm. respectively. The twins appeared to be of the same sex and had a common chorionic sac but two amniotic sacs and two cords. Unfortunately, the specimen was lost before serial sections were made for microscopic study. They were monochorionic and doubtless monozygotic twins.

CASE 9.—B-3939. Private patient. Grav. i, para i. Last normal menstruation Jan. 28, 1924. Date of confinement Sept. 27, 1924. Menstrual age 35 weeks. Mother has had a normal pregnancy and delivery of a normal male infant at term. Twin No. 1. Male. Normal except for some hypospadias. Twin No. 2. Male. Normal except for some hypospadias. The hypospadias was nearly identical in both twins. The placenta was single with a double amnion and a single chorion. There were two umbilical cords both with marginal attachments.

CASE 10.—Source from a series of autopsies. A24-260. Mother 21 years old, para i, menstrual age about seven months. No lues. There was hydramnios of Twin No. 1, which was a female premature and anencephalic. Twin No. 2 was a normal premature female.

The hospital record described a single placenta weighing 700 grams with a single chorion. The infants were considered to be identical twins.

CASE 11.—Source from a series of autopsies. A26-398. The mother was 29 years old. Para ii. Wassermann negative. Twin No. 1 was a premature female of about 32 weeks' gestation. There was hydramnios and the infant was an anencephalic macerate. Twin No. 2 was a female, premature, living infant. The placenta was described as double with a small one for the second. Dichorionic.

CASE 12.—Mrs. M. P. M.G.H. No. G1366, age 32. Para v, grav. vii. No. 22621. Aborted twins about six months' gestation. Twin No. 1. Male, no anomalies, died of prematurity. Placenta small, normal cord 30 cm. long. Twin No. 2. Female with craniorachischisis with a velamentous attachment to the placenta. These were dichorionic twins.



Fig. 3.—Case 8. Feet of one fetus showing deformity involving a foot and digits.

CASE 13.—Case of Dr. P. L. Owen. Mother para iii, grav. iv. Age 33 years. During seventh month of gestation had diphtheric vaginitis. Considerable distress during the latter part of pregnancy with insomnia. Marked distention of abdomen. Triplet No. 1 was female. Delivery spontaneous O.D.A. Birth weight about 2 pounds. Fetus had separate membranes. Lived four days. Triplet No. 2 was female, birth weight about 5 pounds. Dicephalic. Had separate membranes. Delivered by forceps. Respiration on both sides. There were two heads and two necks with two trachea. No external evidence of other deformities. Died shortly after birth. Triplet No. 3 was a female, delivered by breech extraction. Birth weight 5 pounds. Separate membranes. Placenta of very large size. There appeared to be three separate placentas, two of which were normal, more or less fused. The third was completely separated. There was a separate cord for each child. Lived for some time after delivery. Case of trichorionic triplets with fused monster.

CASE 14.—Fused twin from a series of autopsies. (Dicephalus.) Mother para i. Age 23 years. Delivered at term. Infant had two heads. Birth weight 3276 grams. C. H. 48.5 cm. Two vertebral columns. There was a single sternum. The extremities were symmetrical. Defect of right diaphragm permitted the appendix and

intestines to rise up into the plural cavity. The heart showed two ventricular masses with two rudimentary auricular appendages on the right and one on the left. There was a tendency to a duplication of liver lobes with an absence of the gall bladder and ducts. There were two stomachs and some tendency to a duplication of the intestines. Two thymic glands. The placenta weighed 560 grams. The cord was 22 cm. long and showed a central attachment.

CASE 15.—Private case, Mrs. P. Grav. vi, para iv. Last normal menstruation June 26, 1917. Delivered March 4, 1918. Twin No. 1. Female, birth weight 3120 grams, 49 cm., cleft palate and harelip. Thirty-seven weeks' gestation. Twin No. 2. Male, 3315 grams, 49.5 cm. Normal infant. Both cephalic presentations. Placenta was double with two placentas entirely separate. Case of dichorionic twins.



Fig. 4.—Case S. Feet of the other fetus showing similar deformities.

CASE 16.—Mrs. J. B. Private case. B4086. Grav. i, para i. Last normal menstruation March 28, 1924. Due Jan. 7, 1925. Delivery Jan. 1, 1925. Twin No. 1. Female, O.D.A. Alive and mature. Twin No. 2, female, breech extraction. Alive and mature. Number one had club foot. Placenta double with two chorion and two amnion sacs. Case of dichorionic twins.

CASE 17.—Mrs. G. M. Case of Dr. Haggard. G.21-82. Mother para i. Aged 18 years. Pregnancy of about two months diagnosed on May 4. On July 5 patient was sick in bed with nausea, abdominal pain, and uterine bleeding. Improved after five days. Blood pressure and urine were normal. In December she was delivered of normal infant. The placenta was that of a multiple pregnancy—one-half was normal. The other portion showed a fetus compressus lying in a sac of its own on the white, firm, fibrous, and degenerated portion of the placenta. The fetus shows well-developed skeletal structures on x-ray examination. The C.R. length was 15.5 cm. The estimated menstrual age was 19 weeks. Microscopic examination of the placenta showed normal tissue for the living infant and marked degeneration for the dead premature fetus. They were probably dichorionic twins but one could not be absolutely certain of this point.

These cases have been collected from various sources in a somewhat haphazard manner without the present thesis clearly in mind. The data are presented here to stress the importance of careful observation of multiple pregnancy in determining some of the facts with relation to heredity and also with reference to the particular theories regarding the causation of malformation, chiefly from the standpoint of the germinal versus the intrauterine or environmental origin of these conditions. In order to secure some further information some of the literature has been investigated for case reports of malformations in multiple pregnancies. There is much in the literature concerning diseases, neoplasms, etc., which occur in twins not only in fetal, infant

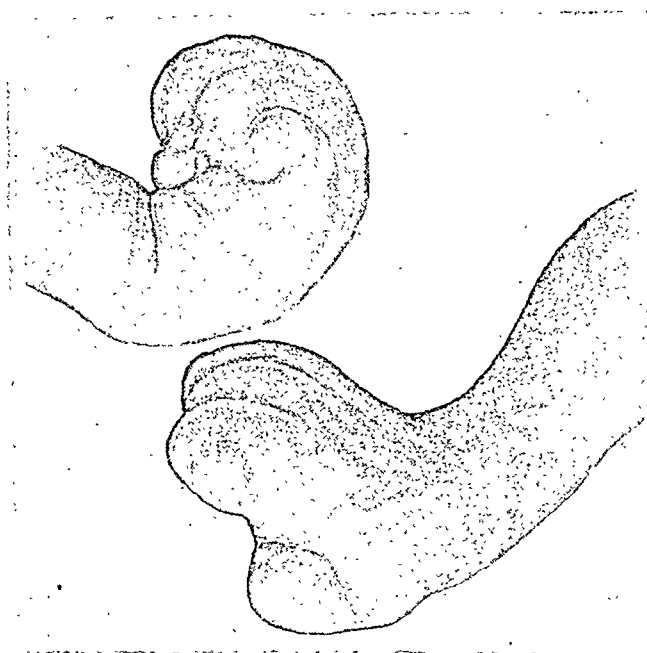


Fig. 5.—Case S. Shows deformities involving the hands.

and child life, but also in adult life. Some of the relationships are peculiar and striking but will not be considered at this time.

It should be borne in mind, according to most observers, that duplicate twins are not identical in all the minutiae. Galton was the first to make definite attempt to determine the degree of identity in human twins and suggested the use of the patterns of friction ridges on the palms and soles. Wilder carried out this study in detail. Newman feels that he goes too far in eliminating certain variations in monozygotic twins. He points out that there are very definite variations in the two sides of the same individual and that we could not expect complete identity in two individuals of monozygotic origin when there are definite differences in the two halves of the same organism. This should not be used as an argument against heredity as there must be

some inequality of distribution of determinative factors during the various cleavages. Siemens has stated that "approximately the same external influences work upon each partner of twins and that the lesser similarity of fraternal twins in comparison to that of duplicate twins must originate in the hereditary 'anlage' and is as a result an index of the hereditary character." Leven has commented that "we have even in duplicate twins no complete identity, but only the greatest known approximation to such a condition."

Birkenfeld quotes from Bauer, "If we find similar morbidity in single ovum twins and are able to eliminate identical external conditions as etiologic factors or exclude accident, then it proves with all the



Fig. 6.—Case 8. Shows deformity of the face of one fetus.

necessary clarity and certainty the significance of the latent predisposition to disease in the individual germ plasm."

Birkenfeld wished to determine whether or not harelip and cleft palate were inheritable conditions and studied 204 cases among which there were eight pairs of twins of which three were of different sex and five of the identical sex. Of the first group both twins, male and female, were affected in only one pair. In four of the five pair it was not possible to determine whether or not the twins were identical. In one set they were identical and had harelip and cleft palate one on the right and the other on the left side. The author has collected eight similar cases of uniovular twins. In most it was of the image or mirror type and in only one pair was the defect on the corresponding side. Case 14 in the present series was of dichorionic twins of opposite sex in which the female infant had a harelip and cleft palate, the male being normal.

There are quite a number of cases in the literature of twins with malformations of the head and spine. It is not my intention to consider all of these but only some which resemble the types encountered in our own series which were of the anencephalic craniorachischisis type. These cases seem to occur in both the mono- and dichorionic twins. Among those who have reported dichorionic twins with anencephalic deformities are Hann, who cites one case with hydramnion and a normal premature female born alive and a male twin with anencephalus born dead. It also had rudimentary extremities. There was a single placenta and one chorion with two amniotic sacks. This is monochorionic but must be dizygotic as the twins are not of the same sex.

Michel has also reported a case of Bonnaire of binovular twins in which the first-born was normal. The second had hydramnios with encephalocele and defective vertebrae. The author states these were binovular twins.

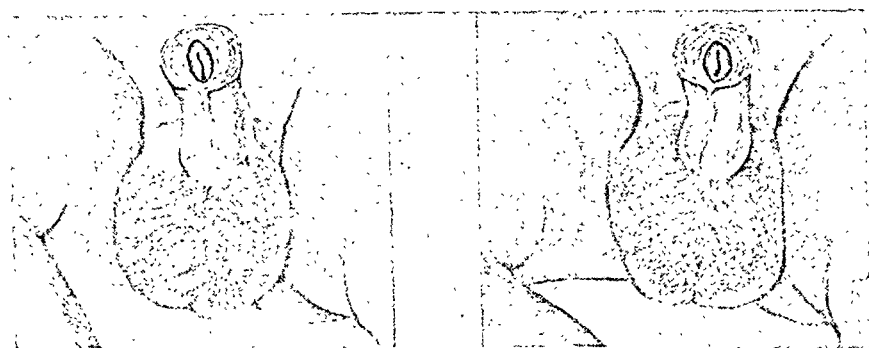


Fig. 7.—Case 9. Drawings from twins showing identical deformities—hypospadias in monochorionic twin fetuses.

Kosmak has also reported a case of dichorionic twins of the same sex (female) having two distinct placentas and sacks. The first-born was normal. The second had hydramnios and was an anencephalic monster.

Foster and Carson have described an unusual case of a multiparous woman about five months pregnant who gave birth to quintuplets after induction of labor. There were three normal female fetuses, one anencephalic fetus and the fifth was a pathologic embryo. All four were females. There were four amniotic sacks with four well-developed cords and a poorly developed fifth attached to the embryonic mass. The statement is not clear as to the chorionic character of these fetuses. There are some reports of monochorionic twins. Lewis has described uniovular twin males with a common placenta and chorion but with two amnions and cords. It was from a first pregnancy and the result of a premature labor. The living male was normal and born first. The second male was of the anencephalic type.

Abelen has also described a case of monochorionic twins of 29 weeks' gestation. The mother had one normal child living. The first of twins had a hydramnion, but there was little amniotic fluid with the second. Both showed signs of life for a few moments after birth. They showed like deformities, both having large spina bifida in the lower lumbar regions, complete eventratio abdominalis, double sided club feet, and nondevelopment of the external genitalia. One had a cystic kidney.

In our series there are four anencephalic monsters, Cases 2, 10, 11, and 12. Of these three are dichorionic and one is stated to be monochorionic. In all of them only one of the twins was deformed. Hydramnios is stated to have occurred with the deformed twin alone in three of the cases. In the fourth there appeared to be no hydramnios. Case 5 was probably dichorionic with one twin showing a cephalomeningocele; the other twin was normal. Case 6 was hydrocephalic and probably dichorionic with only one twin affected. There is no case in which both twins are affected except the case described by Abelen.

The constant association of hydramnios with the monster twin is certainly suggestive of the fetal origin of this condition. It is not surprising that only one fetus is affected in dizygotic twins though one might expect to occasionally find both of them deformed if heredity is a factor. In monozygotic twins one should find similar deformi-



Fig. 8.—Case 16. Shows a dissimilarity in facies of dichorionic twins, one of which had a club foot.

ties in both if it is of germinal origin, though it is conceivable that the cleavage of cells might not always be equally perfect.

It should also be borne in mind that the observations may have been insufficient to establish the diagnosis of uniovular or binovular and that monochorionic is not the necessary equivalent of monozygotic.

There are three cases in the series with deformities of the extremities. Case 4 with a rudimentary left hand and with the thumb and some fingers missing. This was not certainly a case of dichorionic twins.

Case 8 fetuses with malformed heads and symmetrically deformed upper and lower extremities. These fetuses were monochorionic twins.

Case 16 dichorionic twins one of which had one club foot of the talipes calcaneo varus type. Smilga in 1896 reported a case of twins which he considered binovular because of the double placenta and sack. The twins had similar deformities. He now believes them to

be identical as they conform to Siemens' schedule. The deformities consisted in No. 1 twin of an ankylosis of both knee joints with double genu recurvatum and talipes varus; in No. 2 twin there was also a talipes varus with a left genu recurvatum and ankylosis. The mother gave a history of having been born with a club foot.

Berkheiser reports a case of twins with unilateral symmetrical talipes equino varus. Both were females aged twenty months when first seen by him. He does not state whether or not they were identical twins. One cousin had a similar deformity. He found only four cases of bilateral congenital talipes affecting both twins cited in the literature. It would be interesting to know about twins with club feet. The similarity of the deformities in the twin fetuses (8) is certainly striking and strongly suggests a common origin. The absence of a symmetrical deformity in the dizygotic twins (16) argues against environmental cause.

Case 9 is very interesting as the deformities are almost identical in these twins where the evidence points definitely to monozygotic origin.

I have found no citations in the literature of similar cases.

Case 7 is of considerable interest though the dichorionic character of the twins is not established. There is considerable literature on this subject which points to the hereditary character of mongolism. Strictly speaking this condition could not be considered a malformation but it is certainly due to defective development. McLean was one of the first to write of mongolism in twins. He saw these twins when they were six and one-half months old; one was a normal female and the other a male Mongolian idiot. These were the offsprings from the fourth pregnancy. The previous children were normal. The difference in sex points clearly to dizygotic twins of which only one was afflicted. Armstrong reports a similar case but with insufficient data.

Shattuck also cites a case of his own, one female twin was a mongol and the other a normal male. Other children of these parents were normal. One of the two dizygotic twins was affected.

Halbertsma reported a series of cases and stated, "The conclusion that mongolism is germinal in origin is deduced from the fact that mongolism occurs in one of twins. An examination of these cases reveals that all have resulted from a two egg pregnancy. Cases of mongolism in both twins of different sex are unknown; of like sex, there are cases described, which is in accordance with the theory that mongolism has to be regarded as the result of defects inherent in the germ plasma."

Mitchell and Downing have gone through the literature and included in their article many reported cases and add one to their own in which one male was a mongol and the other was normal. They were followed until 14 months of age, when the mongol died. At birth there was a double placenta, chorion, and amnion. They summarized that "These facts are in favor of the theory of mongolism being a germ plasma defect and are against any theory which holds that causes operative during

pregnancy are at fault." "In no case has it been demonstrated that mongolism can occur in one of twins, the result of a single ovum pregnancy." In addition there are some reports of monochorionic twins where both were affected.

Strauch cited a first pregnancy with twins which he considered duplicates where both were mongols. Orel collected 32 cases of mongolism in twins from the literature and added two of his own. In four cases the sex was not stated. In the group of twins of opposite sex never more than one was affected. In those of the same sex four pairs had mongolism and only one of the twins had this defect in the remaining pairs. The author believes mongolism to be hereditary. Reuben and Klein review some of the literature and report a case of male twins apparently identical. Both had similar diseases at corresponding ages and both had undescended testicles. Finger prints and x-rays of both correspond. Both of these twins were mongols. The evidence from the case reports in the literature seem to indicate with some certainty that of dizygotic twins only one is ever affected with mongolism and that in monozygotic twins both are affected.

There are three cases in our series which should probably not be included among malformations as they doubtless result from fetal deaths and partial absorption. This could be more properly considered as an environmental condition which could arise with either a monochorionic or dichorionic twin.

Case 1 presented evidence of being a fetus compressus and a monster as well in dichorionic twins.

Case 3 a fetus papyraceus in dichorionic twins.

Case 17 a fetus papyraceus in which it is not certainly dichorionic. Mall has described binovular embryos in which there was a normal embryo of about three weeks on one side of the chorion and a well-developed umbilical vesicle on the other side. This is somewhat different from the fetus papyraceus but is of interest in this connection.

Mosher reported a case of fetus of about five months' gestation with the delivery of a normal infant at term. Single placenta with two cords inserted at its periphery. Two amnions. He states there are 88 cases in the literature. Normal female delivered at term to multiparous woman. Placenta came spontaneously and had incorporated in the membranes of the first twin a papyraceus fetus about 16 cm. long and a degenerated placenta attached to the fetus papyraceus by a degenerated cord. This fibrotic placenta was about 6 cm. in diameter. This appears to be a case of dichorionic twins. There are also two curious cases reported of triplets with two of the fetuses as papyracei. Wolff has cited one of these and Moss the other. In the former case the normal infant had a separate placenta and the two papyracei were duplicate twins with a single sack. The latter also delivered a normal infant with its own placenta. The papyracei had a bilobed placenta with a common sack.

Ayora describes a case of female monochorionic fetuses, one edematous probably from strangulation of the cord, and the other a fetus papyraceus. It would seem that this condition could develop in either monochorionic or dichorionic pregnancies from causes which produce fetal death in one twin without bringing on a premature labor or causing the death of the other.

There are two cases of fused twins which must be monozygotic. These are 13 and 14. Fused twins are not commonly seen but are well known and there are many varieties.

Case 13 is unique and Dr. Owen gave me the description but did not have as good an opportunity to study the placenta as he wished. It amounts to quadruplet with a trizygotic multiple pregnancy. The fused twins are monozygotic and each of the other two fetuses seem to have had their own placenta and chorion. It would be difficult to account for such a combination on anything except a defective duplication of the germ plasm. The other fused twin is mentioned as a case to illustrate the result of incomplete or possible late cleavage. It would not be at all difficult to imagine two complete monozygotic individuals as a result of an earlier and more extensive cleavage of fertilized ovum.

As a result of this consideration one might state that we should make a more earnest effort to determine at the time of birth whether the infants in multiple pregnancies are monozygotic or dizygotic. This can be done by comparing the twins and noting the points of similarity, by examination of the placentas for separation and lines of cleavage to determine whether or not it is a single placenta or in reality two fused placentas. The examination of the membranes is important especially in the partition between the two sacks. One can often determine whether or not there are two or three layers and thus decide if it is a monochorionic or a dichorionic pregnancy. The observation of the cords is also of importance as this may give one suggestive evidence of one or two placentas.

The study of diseases and conditions affecting the intrauterine life of fetuses would be definitely enhanced by such observations which would ultimately prove whether or not certain affections are inherited or acquired and of germinal or environmental origin. Dizygotic twins might conceivably have the same unusual condition, but one would hardly expect two such ova to be fertilized at the same time. Environmental conditions should affect both more constantly. Monozygotic twins should have similar conditions develop as the result of cleavage of the same ovum or if one considers a double nucleus as the etiology of twins the result should be similar. One could not expect these changes to be uniformly and constantly identical. Environmental conditions should act upon monozygotic twins in about the same manner as upon dizygotic except they might be more nearly equal in their susceptibility to various externals because of their greater similarity.

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GRANULOSAL-CELL TUMORS OF THE OVARY AND THEIR RELATION TO POSTMENOPAUSAL BLEEDING

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TUMORS of the ovary having a tendency in their growth to the formation of structures resembling graafian follicles have been the subject of considerable interest in the German literature for many years. Since v. Kahliden's case of "Adenoma of the Graafian Follicle with Transition to Carcinoma" was reported in 1895, numerous investigators have given us more or less similar cases. R. Meyer, R. Schröder, Krompecher, Neumann, Scheyer, Blau, Glockner, Voigt, Tietze, Mullerheim, Isbruch, Aschner, Gottschalk, and others, have all reported cases of this group of tumors. Judging from the histologic descriptions and photomicrographs of these cases, it would seem that we are dealing with a group of tumors closely related, but not identical, having in common one characteristic, a tendency to the formation of structures resembling the graafian follicles. Histologically, there are variations in structure on the basis of which different authors have subdivided the group into specific types. Various names have been applied to these allied tumors, such as adenoma of the graafian follicle, folliculoma ovarii malignum, carcinoma folliculoides, oöphoroma folliculare, and granulosal-cell tumors. Meyer has divided the granulosal-cell tumors into the folliculoid and cylindroid, both structural types frequently being present in the same tumor. In the American literature, I have found only three cases, the first reported by M. Robinson in 1923 and the other two by E. S. J. King, in 1929. There is little doubt but that we are dealing with a group of the rarer ovarian growths, and it is my belief that the tumors are more frequent

than might be supposed from the relatively small number of cases reported in the literature for, since our first case in 1926, we have encountered three others. The fact that these tumors have failed to attract the attention of American gynecologists is particularly remarkable, for no ovarian tumors are more interesting histologically and histogenetically. From a clinical point of view they also deserve recognition because of their frequent association with postmenopausal bleeding, a symptom upon which more light may be cast with much profit.

The following three cases of granulosa-cell ovarian tumor illustrate the characteristic history of these neoplasms.

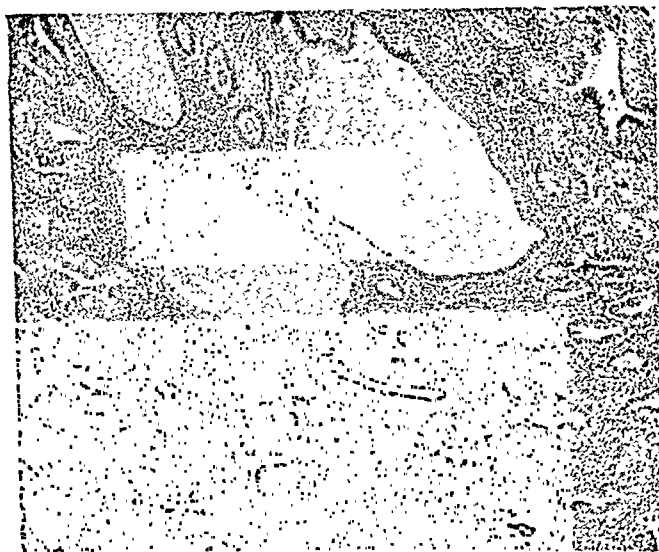


Fig. 1.—Endometrium of Case 1. Note the abundance of glands and great variation in caliber of the glands, showing the typical "Swiss-cheese" pattern characteristic of hyperplasia.

CASE 1.—Mrs. M. F., aged sixty-five, complained of vaginal bleeding. The menstrual history prior to her menopause, 22 years previously, was entirely normal. She was married at twenty-four and had had five full-term pregnancies. The oldest child was forty-one, the youngest twenty-three. Six months prior to coming to us she had bled for a few days, the first time since her menopause. Since this time she had bled for a few days approximately once a month "about as profusely as a normal period."

The patient was a very well-nourished woman. Hemoglobin 75 per cent, but the general examination otherwise of no special interest. Pelvic examination showed a uterus rather large for the patient's age. Cervix transversely lacerated but otherwise normal. To the right of the uterus was a soft mass about the size of a small orange. The left ovary was not felt.

Operation.—Dilatation and curettage was first done. The curettings showed no gross evidence of malignancy. A supravaginal hysterectomy, double salpingo-oophorectomy was done. The patient made an uneventful recovery and is well four years after operation.

Pathology.—Gross: The supravaginally amputated uterus was larger than normal for the patient's age. It measured 10 × 8 × 6 cm. There were two very small intra-

mural fibroids. The endometrium was considerably thickened and ragged, no doubt as a result of the curettement which had preceded the hysterectomy. Both tubes were normal. The right ovary was enlarged to form a tumor 8 cm. in diameter. It was soft and spongy, evidently being partly cystic. The surface was smooth and free from adhesions. On section the tumor was honeycombed in structure and

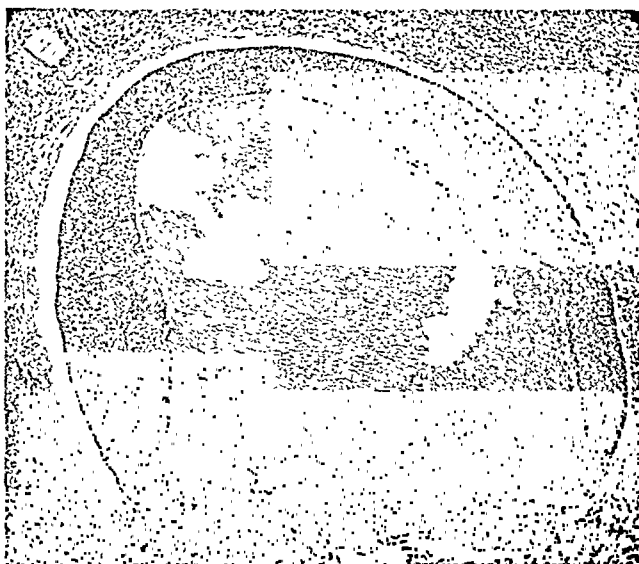


Fig. 2.—Moderate-sized follicle from Case 1. Note the broad zone of granulosa-like cells surrounding the cavity which in this case contains blood.

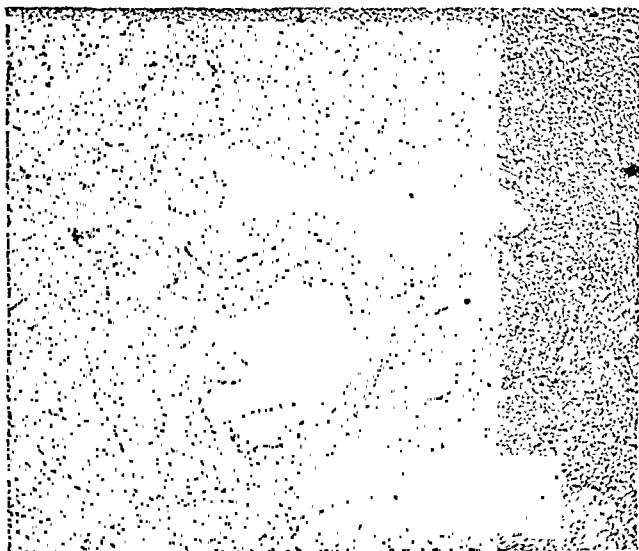


Fig. 3.—Two smaller follicles from Case 1. They contain an eosin-staining homogeneous substance containing some blood and cellular debris.

blood and straw-colored fluid poured out. The cysts varied in size from 3 cm. to just within the range of visibility. The left ovary was a normal senile structure.

Microscopic: The endometrium was much thickened. There was a great increase in the glandular elements and a great variation in the caliber of the glands, the typical "Swiss cheese" pattern characteristic of hyperplasia being present (Fig. 1). The epithelium lining the glands was for the most part higher than that

lining normal glands. There was no appreciable change in the stroma. There was considerable invasion of the myometrium by the glands and stroma of the endometrium. Several small fibroid nodules with considerable hyaline change were in the uterine wall. Both tubes were normal. The left ovary was a normal senile structure showing the usual histologic changes incident to advanced age. The right ovarian tumor was composed partially of solid tumor tissue and partially of cysts varying from minute size to 3 cm. in diameter. The cysts were follicle-like structures, the minute ones suggesting primordial follicle, the larger ones the more mature follicle, and the largest ones resembling graafian follicle cysts (Fig. 2). The content of the follicular spaces was a homogeneous eosin-staining substance. Mixed with this substance in certain of the cysts were blood and cellular debris (Fig. 3). The cysts were lined with a zone of cells closely resembling the granulosa cells of a normal follicle. Between these cystic structures were solid areas of these cells, in some areas closely packed, while in other areas columns and clusters of the

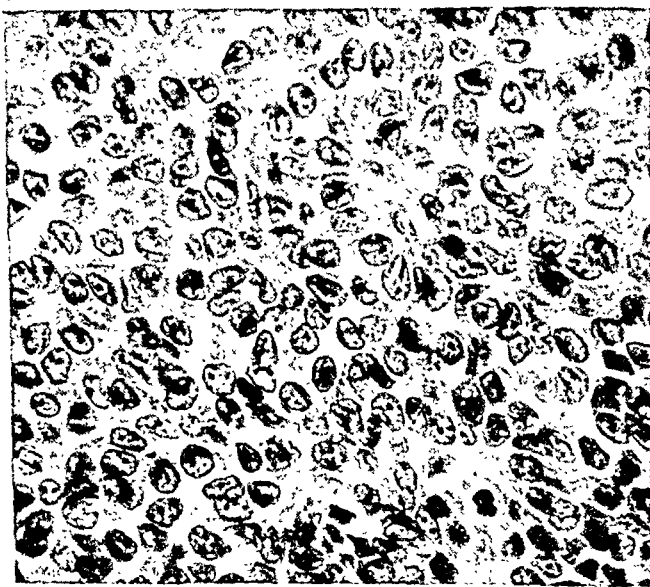


Fig. 4.—High power field of the tumor cells of Case 1. Note their uniform character.

cells were separated from one another by fibrous tissue. Examination of the tumor cells under higher magnification showed them to be very uniform in size and shape (Fig. 4). An occasional mitotic figure was seen. The tumor was very vascular.

Pathologic Diagnosis.—Granulosa cell tumor of the right ovary; hyperplasia of the endometrium; adenomyoma of uterus; small intramural fibroids.

CASE 2.—Mrs. E. T., aged fifty, complained of enlargement of the abdomen and vaginal bleeding. The menstrual history had been normal up to the menopause, which had occurred eight years previously. She had had seven full-term pregnancies and one seven months' premature child. Four years after the cessation of her menses she again began to bleed irregularly. The interval was one to three weeks, the duration four to five days. At times the bleeding was scanty, at times profuse. Two years before she came to us she had first noticed enlargement of her abdomen, which had steadily increased in size. Two months previous to admission the cervix had begun to protrude from the vagina.

General examination showed a poorly nourished woman, moderately anemic (hb. 70 per cent). The abdomen was markedly enlarged, palpation and percussion suggesting the presence of a huge abdominal tumor. Pelvic examination showed the

cervix protruding from the outlet. It was not ulcerated. The entire pelvis was choked with a huge cystic mass extending up to the xiphoid. The uterus could not be outlined.

Operation.—Through a long midline incision, the huge right-sided ovarian tumor, which was perfectly free in the abdomen, was removed. The uterus was flattened



Fig. 5.—Section from periphery of tumor of Case 2. Note the heavy fibrous capsule.



Fig. 6.—Portion of wall of large cystic follicular structure from Case 3.

out as a result of the pressure of the cyst. The left ovary appeared normal. Because the patient's condition would not warrant further operation, the uterus was fixed to the abdominal wall and the abdomen closed.

The patient made an uneventful recovery and is well two years after operation.

Pathology.—Gross: The tumor consisted of a large, soft, apparently cystic structure, 30 cm. in diameter and weighing 20¼ pounds. It was smooth externally and

free from adhesions. The elongated tube was attached to it. On section the tumor was multilocular, the locules varying in diameter from several centimeters to one or two millimeters. The locules were lined by a smooth surface and filled with a slightly viscid, straw-colored fluid. The walls between the locules varied in thickness from a millimeter to two or three centimeters, and varied in color from yellow to a flesh pink. Nowhere was there any evidence of papillary growth.

Microscopic: The tumor was completely enclosed by a heavy fibrous capsule (Fig. 5). The cysts were lined with a zone of columnar and polygonal cells with dark-blue staining nuclei resembling normal granulosa cells (Fig. 6). Within this zone of cells there was in many of the cysts an inner zone of hyalinized fibrous tissue. This was true in most of the larger cysts, whereas the smaller ones were lined directly by the granulosa-like cells. Between these follicle-like structures was a fibrous stroma invaded markedly by tumor cells which also were of the general character of granulosa cells. The cells were generally uniform in size and shape and no mitotic figures were seen. The fibrous stroma showed extreme hyalinization.

Pathologic Diagnosis.—Granulosa-cell tumor of ovary.



Fig. 7.—Small tumor from Case 3. It is composed of two portions, the follicular structure shown above and a solid portion, part of which is shown in the lower part of the photomicrograph. Note the lightly staining cells about the periphery of the follicle, resembling theca interna cells.

CASE 3.—Mrs. R. M., aged 43, complained of vaginal bleeding. The menstrual history up to the present illness had been quite normal. During the past year the menses had gradually increased in profuseness and in duration until the past month, when bleeding had been constant. She now complained of weakness and shortness of breath.

Examination revealed a well-nourished, extremely anemic woman. Hemoglobin only 17 per cent. Pelvic examination showed that the vagina was completely filled with a pedunculated fibroid attached to a pedicle which passed up into the uterine cavity through the dilated cervix. The uterus was transformed into a multinodular fibroid. After one transfusion of 600 c.c. of blood a vaginal myomectomy was done. A second transfusion of 550 c.c. of blood was given.

Operation.—Hysteromyomectomy, double salpingo-oophorectomy.

Pathology.—Gross: The uterus was enlarged and distorted by the presence of several intramural fibroids. The endometrium was smooth and rather thin. Both tubes were small, thin-walled structures but covered with shaggy adhesions. Both ovaries were of normal size but each was adherent to its corresponding tube.

Microscopic: The fibroids showed the usual microscopic picture. The endometrium showed the postmenstrual pattern but otherwise was not noteworthy. The tubes showed moderate fibrous and round-cell infiltration. The left ovary showed several corpora albicantia but no corpora lutea or follicles. In the medulla of the ovary, near the hilum, was a tumor, about 3 mm. in diameter. It was composed of two parts, the one follicular in contour and the other a solid mass of cells of the same nature as those forming the follicular structure (Fig. 7). The follicular structure was composed of granulosa-like cells arranged about a central cavity containing some eosin-staining homogeneous material and red blood cells. The cells at the periphery of the zone of granulosa cells were columnar in type, while the others surrounding the central cavity were closely packed polygonal cells. Surrounding this structure was a zone of lightly staining cells closely resembling normal theca interna cells (Fig. 7). The solid portion of the tumor was composed of cells of exactly the same type. Scattered through the whole tumor were small vacuoles immediately surrounded by cuboidal cells. Mitotic figures were frequent but most of the cells were very uniform in size and staining qualities.

Pathologic Diagnosis.—Myomata uteri; chronic salpingitis; very early granulosa-cell tumor of right ovary.

Morphology.—Granulosa-cell tumors of the ovary are for the most part unilateral, although occasionally a bilateral growth is described. In the majority of the cases, the tumor occurs alone without any other pathologic condition of the ovary, but Meyer described a granulosa-cell tumor and fibroma in combination, as well as one associated with a papillary cystoma. In size they usually vary from the almost microscopic tumor, discovered accidentally, to the size of a man's head. In many cases described, the tumors are hardly larger than a normal ovary. Our Case 3 illustrates one of the smallest tumors, being about 3 mm. in diameter, while our Case 2 is an outstanding exception, the tumor being 30 cm. in diameter and larger than any I have found described in the literature. The tumors are, for the most part, very well encapsulated by a thick fibrous capsule (Fig. 5). As a result of their semicystic structure they are usually soft and spongy in consistence. This is particularly true of the larger tumors in which cyst-like structures attain a considerable diameter. On section the growths reveal their semicystic nature. The more solid portions of the tumor contain small round spaces just within the range of visibility. Other parts of the tumor contain cysts several centimeters in diameter, the content of which is a clear straw-colored fluid. Considerable blood also pours forth on section, indicating marked vascularity. The cut surface is fleshy in color.

Microscopically the neoplasms are characterized by two features: (1) the resemblance of the tumor cells to granulosa-cells of the normal ovary; (2) the tendency to form structures resembling graafian follicles and follicular cysts. Meyer describes two histologic types, the folliculoid and cylindroid. In the former the follicular structure dominates, whereas the latter is a solid structure composed of these same granulosa cells broken up into strands and figures to form

bizarre patterns by the ingrowth of connective tissue stroma (Fig. 8). Both of the structural types are usually present in variable proportions in the same tumor, although tumors are described of practically the pure folliculoid and of the pure cylindroid type. The smallest follicles are lined with a single layer of cuboidal or flattened epithelial cells and in size approximating the normal primordial follicles. The larger folliculoid structures are bounded by a zone of closely packed polygonal cells with dark-blue staining nuclei and scanty cytoplasm. Limiting this zone of cells at its periphery there is frequently a hyalinized basement membrane. The first layer of cells adjacent to this basement membrane is cuboidal. Within the zone of granulosa-like

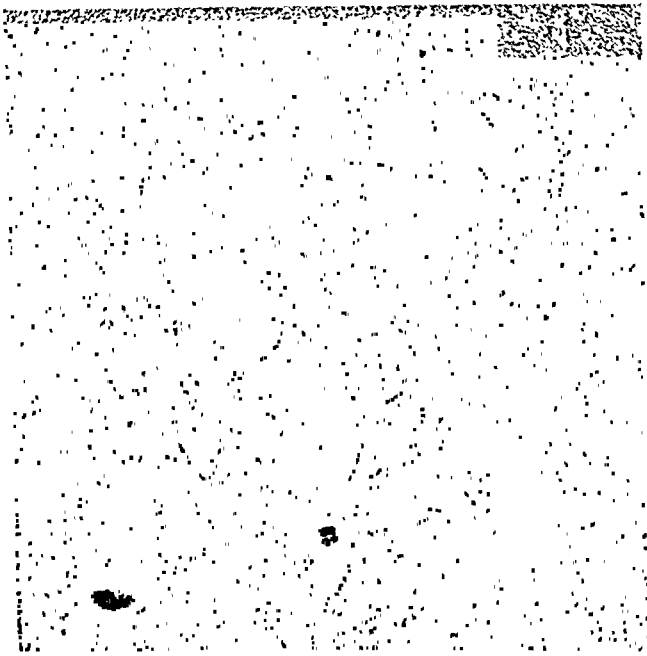


Fig. 8.—Solid portion of tumor of Case 2. The tumor cells are broken up into strands by fibrous stroma, forming the so-called cylindroid type of granulosa tumor.

cells, separating it from the central cavity, there is frequently an inner zone of hyalinized fibrous tissue of variable width (Fig. 9). This is particularly true in the larger cysts, whereas it is uniformly absent in the small structures resembling the primordial follicles. Very rarely a band of clear lightly staining cells surrounds the zone of granulosa-like cells, resembling the theca interna cells of a normal follicle (Fig. 7). The content of these folliculoid structures is an eosin-staining homogeneous substance, often containing a small amount of blood and cellular debris. In spite of a careful search no cells resembling ova were found in these follicular structures. The tumors are, for the most part, quite vascular. Blood vessels of various sizes are numerous, and frequently large blood spaces are seen, lined with a single layer of very flat epithelium (Fig. 10).

Under the high power magnification the low columnar and polygonal tumor cells are very uniform in size, shape and staining qualities (Fig. 4). The light eosin-staining cytoplasm, for the most part, is scanty. The nuclei are round or oval and take a rather deep hematoxylin stain. In the very small tumor of Case 3 mitotic figures are moderately frequent. In the moderate-sized tumor of Case 1 mitotic figures are occasionally seen, but in the huge tumor of Case 3 no mitoses are seen. In this, the largest and probably the oldest tumor of our series, there is a much greater proportion of fibrous stroma and extreme hyalinization. The presence of mitoses in the smaller tumors, their absence in the largest one, and the extreme fibrosis and hyalinization of the huge tumor, would seem to indicate that the younger

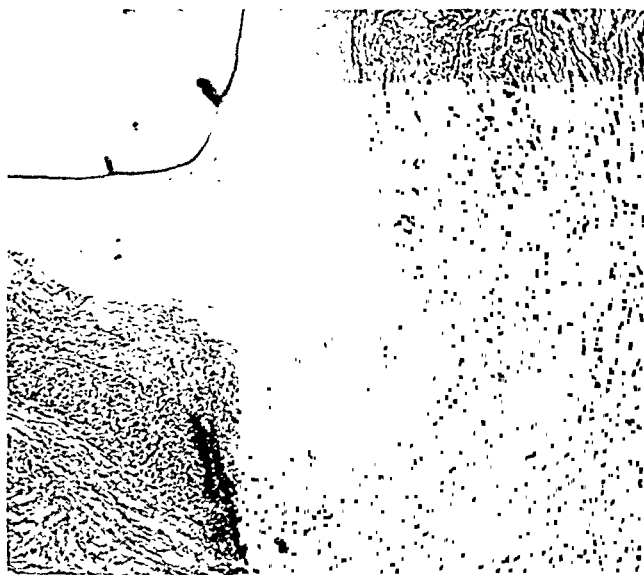


Fig. 9.—Section of wall of large follicular structure from Case 2. Note the heavy fibrous zone separating the poorly preserved granulosa layer from the cavity.

the tumor the more active the growth, whereas the largest and oldest tumor shows very little evidence of active growth and marked evidence of fibrosis and degeneration.

Histogenesis.—There are several characteristics of these tumors which would seem to suggest their origin from granulosa epithelium. The histologic character of the tumor cells, the tendency to form follicle-like structures, and the apparent effect of the tumor upon the endometrium in the formation of hyperplasia, all suggest that the tumor cells are related to granulosa cells. Concerning the exact origin, two possibilities present themselves. One of these is that the tumors arise from the adult granulosa cells of the graafian follicles and the other, that they arise from embryonic rests of ovarian parenchyma, which genetically is closely related to the adult granulosa cells. In order to understand better the histogenesis of these tumors

it might be well to review briefly the embryologic development of the ovary. The organ arises, as does the testis, as an indifferent sex gland on the ventro-mesial surface of the urogenital fold. The coelomic epithelium in this region becomes several layers thick, the mass of cells thus formed lying adjacent to the mesonephros. Soon the epithelial mass becomes differentiated into a layer of superficial surface epithelium and an inner cell-mass. From this inner cell-mass arise the ova cells, the granulosa cells, the medullary cords and the rete ovarii. The ovarian stroma is developed by an ingrowth of connective tissue from the adjacent mesonephros. Beginning with the third month some of the epithelial cells of the medulla and cortex degenerate to allow the ingrowth of this stroma. By virtue of this ingrowth of connective tissue the epithelial cells are separated into clusters, the so-called



Fig. 10.—Field from solid portion of tumor of Case 1. Note the large thin-walled blood spaces.

egg-nests, containing the cells destined to become ova and their surrounding flattened epithelium, the early granulosa cells. Early in the development of the ovary a medullary and cortical portion can be recognized. In the medullary portion the parenchyma forms medullary cords and rudimentary follicles which soon degenerate. The primordial follicles in the cortex persist so that at birth and thereafter the follicles are limited to the cortex.

Robert Meyer has favored the view that the tumor cells originate from the embryonal parenchyma rests. He believes that the origin of a tumor from the adult granulosa cells is very unlikely because the growth of those cells depends so absolutely upon the life of the ovum. Under no condition, such as in inflammations, has he ever observed any proliferative tendency on the part of the follicular epithelium.

The active proliferation of the granulosa cells into lutein cells begins at the death of the ovum. The majority of these tumors occur after the menopause when the ova have been absent for some years. Upon the basis of this slave-like subordination of adult granulosa cells to the living ovum, Meyer feels that neoplastic activity of these adult cells is very unlikely. This evidence, however, is chiefly against the origin from mature follicles rather than positive evidence in favor of their origin from embryonal rests.

Our Case 3 shows an extremely early but completely formed granulosa-cell tumor discovered accidentally in routine section of the ovary. It is situated in the medulla near the hilum of the ovary. Our knowledge of ovarian histology teaches us that in adult life the follicles are limited to the ovarian cortex. The origin of this very early granulosa tumor in the medulla practically excludes an adult follicle as its origin. In the medulla, as above described, there is much ovarian



Fig. 11.—Gross specimen from Case 4. Note the well encapsulated tumor which was about the size of a grapefruit, and the uterus, which was as large as that of a woman during active menstrual life.

parenchyma in embryonic life which degenerates more or less completely before birth. By virtue of the position of this small tumor it would seem that embryonal rests of this epithelium, very closely related to the adult granulosa epithelium, would be practically the only possible origin of this granulosa tumor in the ovarian medulla. Therefore in our Case 3 I feel that its origin from embryonal granulosa rests is clearly indicated. Further observations on extremely early tumors would be of great value in establishing still further the histogenesis of these neoplasms.

The following is a case illustrating a tumor similar to that described by Brenner as *oöphoroma folliculare*. The history of profuse recurrent postmenopausal bleeding, as well as the tendency to form follicular structures, suggests a relationship to the granulosa-cell tumors, but the individual cells do not closely resemble the granulosa-cells of the above tumors. Because of this probable relation to the granulosa-cell tumors it is reported:

CASE 4.—Mrs. G. H., aged sixty-two, complained that her menses had never ceased. On close questioning, however, it was learned that her periods had been quite regular until eight years previously. She then had amenorrhea for six months. Since that time she had bled irregularly, each bleeding being fully as profuse as a normal menstrual period. Never was there a period free from bleeding of more than a month, the interval usually being considerably less than thirty days. She had been married thirty-five years and had had five full-term pregnancies and two early, spontaneous abortions. For the past three months bleeding had been almost constant and at times very profuse. Hemoglobin 75 per cent.

General examination showed a large, raw-boned woman, 6 feet, 1 inch tall and weighing 215 pounds. She had marked hypertrichosis of the face, having shaved daily for years. For the past few years she had been known to have diabetes mellitus and was using insulin daily.

Pelvic examination showed the cervix transversely lacerated, but otherwise normal. The body of the uterus was rather large for the patient's age and in anteversion.



Fig. 12.—Section of endometrium from Case 4. Within the carcinomatous areas as benign endometrial glands showing the hyperplasia pattern.

Behind the uterus was a very firm, nodular tumor, the size of a grapefruit, occupying the culdesac and extending to the lateral pelvic walls.

Operation.—Supravaginal hysterectomy; double salpingo-oophorectomy.

The patient had a pulmonary infarct 17 days after operation, which she survived and is well one year later. She was given radium in the cervical stump because of the discovery of carcinoma of the endometrium.

Pathology.—Gross: The specimen consisted of a uterus considerably larger than normal for the patient's age, a small, senile left ovary, a normal-appearing left tube, and a tumor 14 × 11 × 8 cm. which replaced the right ovary, across which the right tube was stretched (Fig. 11). Upon sectioning the uterus, the endometrium was seen to be greatly thickened and roughened down to a point about 3 mm. above the point of amputation. Its gross appearance suggested carcinoma rather than hyperplasia. The right ovarian tumor was a grossly nodular, encapsulated, very firm tumor, yellowish white in color. The external fibrous capsule was smooth and

glistening, there having been apparently no adhesions between it and the surrounding structures. On section, the tumor appeared much like the usual fibroma, but on close inspection innumerable small cavities from pinhead to pinpoint size could be seen, filled with a yellowish gelatinous material (after fixation).

Microscopic: Most of the endometrium was transformed into a typical adenocarcinomatous growth which had invaded the myometrium very slightly. Between the carcinoma, small areas of nonmalignant endometrium were seen. These non-malignant glands were extremely variable as to caliber and suggested hyperplasia of the endometrium (Fig. 12).

The left ovary showed the usual histologic picture of a senile ovary.

The right ovarian tumor was enclosed in a thick fibrous capsule. The stroma of the tumor was very abundant, composed of closely packed spindle-shaped cells resembling normal ovarian stroma. Invading this stroma were islands of epithelium, some solid and others arranged about a central cavity containing eosin-staining



Fig. 13.—Section of ovarian tumor of Case 4. Note the follicle-like structures and the islands of solid tumor cells between which is an abundant fibrous stroma.

homogeneous substance and cellular debris (Fig. 13). In some of the follicular structures the surrounding epithelium was completely degenerated, leaving simply a cavity within the fibrous stroma. The tumor cells were oval or polygonal in shape with round or oval vesicular nuclei. There were no hyperchromatic nuclei and no mitoses.

Clinical Considerations.—Considering a neoplasm from a clinical point of view, perhaps the most important question concerns its malignancy. From a purely structural standpoint this group occupies rather a middle position. All of our four tumors were very well encapsulated. Even the huge 30 cm. granulosa tumor, which had a history of at least four years' duration, was perfectly encapsulated and lay free in the abdominal cavity. The tumor cells of our granulosa-cell tumors, as well as the oöphoroma folliculare invaded the fibrous

stroma of the tumor much in the manner of a malignant growth, but there is no invasion of the fibrous capsule. The tumor cells are, for the most part, very uniform in size and staining qualities. Mitoses, however, were frequently seen in the extremely small tumor but were entirely absent in the largest tumor, and a great deal of fibrosis and hyalinization were present. This suggests that perhaps in the very early stage growth is quite rapid but eventually, with fibrous tissue proliferation and diminution in the blood supply, growth becomes impaired and hyalinization results. Our case of oöphoroma folliculare also had a great abundance of fibrous stroma surrounding the various follicle-like structures.

However valuable histologic study may be in predicting the nature of a given tumor, the final criterion of malignancy is whether or not the tumor is capable of causing the death of the patient. To determine this, a search was made in the literature for end-results. Unfortunately, many of these tumors are reported from the pathologic rather than the clinical point of view, and end-results are not available. Brenner considered his cases of oöphoroma folliculare as benign. In one of his cases the tumor had been kept under observation for four years prior to operation and surgical measures were undertaken only when an increase in size could be detected. At operation no evidence of extension of the tumor was made out. The patient died eight days after operation of intestinal obstruction. The history of our case prompts me to agree with Brenner as to the benign nature of these tumors, for in spite of a history of eight years' duration the tumor was perfectly free in the pelvis and the patient is well a year after operation. It will be seen by reference to Table I that the granulosa-cell tumors have been labelled carcinoma by various authors. It will be noted, however, that in many of the cases there has been no follow-up and that the label of malignancy has been made entirely on histologic grounds. Only four of the cases have been followed until death. One of these, Neumann's patient, died six days after operation. In this case, however, there was an associated malignant papilloma. Hence, this death cannot be fairly attributed to the granulosa tumor. In Aschner's Neumann's and Voigt's cases all the patients died six months after operation, with definite recurrences. On the other hand, in this small series of 33 cases, only 17 of which were followed, 13 of the patients are reported as well from one to eleven years after operation. From these data we have concluded that the majority of the tumors are relatively benign but that malignant forms occasionally occur. Certainly, the majority of the tumors are sufficiently benign to insure an excellent chance of operative cure.

Reference to Table I will show that, although cases are reported in young women, the majority of these tumors occur after the cessation of the menses. The average age in this small series from the literature

TABLE I. SHOWING AGE INCIDENCE AND ULTIMATE FATE OF PATIENTS

| AUTHOR | NAME APPLIED TO TUMOR | AGE | END-RESULT |
|-------------------|--|------------------------|---|
| Aschner | 1. Granulosal-cell tumor | Near meno- pause | Died 6 months after operation with recurrence |
| | 2. Granulosal-cell tumor | 25 | Well 1½ years after operation |
| Blau, A. | Carcinoma of ovary (Follicular-like structure) | 33 | Not given |
| Brenner | 1. Oöphoroma folliculare | 62 | Died 8 days after operation— intestinal obstruction |
| | 2. Oöphoroma folliculare | “Old woman” | Incidental finding at autopsy |
| | 3. Oöphoroma folliculare | 72 | Incidental finding at autopsy |
| Glockner | Cylindroma | 50 | Not given |
| Gottschalk | Folliculoma ovarii malignum | 48 | Well 4½ years after operation |
| Isbruch | 1. Granulosal-cell tumor (Carcinoma cylindromato- sum) | 60 | Well 11 years after operation |
| | 2. Granulosal-cell tumor (Carcinoma cylindromato- sum) | 70 | Well “some time” after opera- tion |
| King, E. S. J. | 1. Granulosal-cell tumor | 51 | Not given |
| | 2. Granulosal-cell tumor | 62 | Not given |
| Krom- pecher | 1. Follicular oöphoroma | 60 | Not given |
| | 2. Follicular oöphoroma | ? | Not given |
| Meyer | 1. Fibroma and granulosal-cell tumor | 53 | Not given |
| | 2. Dermoid and cylindroma | 70 | Not given |
| | 3. Granulosal-cell (cylindroid) | 60 | Not given |
| | 4. Carcinoma folliculoides | 63 | Not given |
| Müllerheim | 1. Granulosal-cell tumor (ma- lignant) | 72 | Not given |
| | 2. Granulosal-cell tumor | 69 | Well 8 years after operation |
| Neumann | 1. Carcinoma folliculoides | 50 | Died 6 months after operation with recurrence. Metastasis found in gland at operation |
| | 2. Ovarian carcinoma with cyl- indroid structure | 34 | Well 2½ years after operation |
| | 3. Granulosal-cell tumor | 36 | Well 2½ years after operation |
| | 4. Carcinoma cylindromatosum | 35 | Well 2½ years after operation |
| | 5. Medullary carcinoma with follicular cysts | 16 | Well 2½ years after operation |
| | 6. { Fibroma Malignant papilloma Carcinoma cylindromatosum | 61 | Died 6 days after operation |
| Robinson | Folliculoid carcinoma | 59 | Not given |
| Scheyer | Granulosal-cell carcinoma | 40 | Not given |
| Schröder | Granulosal-cell tumor | 45 | Not given |
| Te Linde | 1. Granulosal-cell tumor | 65 | Well 4 years after operation |
| | 2. Granulosal-cell tumor | 50 | Well 2 years after operation |
| | 3. Granulosal-cell tumor | 43 | Well 2 years after operation |
| | 4. Oöphoroma folliculare | 63 | Well 1 year after operation |
| Tietze | Granulosal-cell tumor | 35 | Not given |
| Voigt | Carcinoma folliculoides ovarii | 47 | Patient died in 6 months of recurrence |
| v. Kahlden | Adenoma of graafian follicle with transition to carcinoma | Young girl | Not given |

is fifty-two, the oldest patient being seventy-two and the youngest sixteen. In 70 per cent the tumors occurred after the age of forty-five. In the cases occurring during the menstrual life practically all the women had some disturbance of menstrual function, usually metrorrhagia. In our Case 1, twenty-two years after the onset of the menopause, the patient began to bleed approximately every month for a few days, over a period of six months. In Case 2 the patient began to bleed irregularly four years after the cessation of her normal menstrual life. In Case 4 the sixty-three year old patient stated that she had never stopped menstruating. Close questioning, however, brought out the fact that eight years before, at the age of fifty-five, she had not menstruated for a period of six months. This may probably be interpreted as the normal menopause, the recurrence of bleeding being due to the presence of ovarian tumor. The profuse bleeding, three months before the operation, was undoubtedly explained on the basis of carcinoma of the endometrium. These histories of postmenopausal bleeding are typical of those reported in the literature with this type of tumor. The question naturally arises whether the granulosa-cell tumors and the closely related oöphoroma folliculare are the only ovarian tumors associated with bleeding after the menopause. A survey of the literature, as well as of our own ovarian tumors occurring at this time of life, brings out the fact that bleeding may occur with other ovarian tumors. Schiffmann, who has been particularly interested in ovarian tumors associated with postmenopausal bleeding, has reported several types of ovarian carcinoma occurring in old women with vaginal bleeding. Moulouguet-Doleris found bleeding in 19 of 74 cases of various types of benign and malignant ovarian tumors after the menopause. Robert Meyer reported a round-cell sarcoma and fibroma of the ovary associated with postmenopausal bleeding. Scheyer collected from the literature seven cases of ovarian carcinoma and two cases of ovarian sarcoma following the artificial menopause produced by radium therapy. In the gynecologic-pathologic laboratory at Johns Hopkins Hospital we have had, in the past ten years, 41 cases of tumor of the ovary from postclimacteric women. In 9 of these 41 cases there was vaginal bleeding. In 3 of the 9 cases this bleeding could be readily explained on the basis of the extension of the carcinoma of the ovary to the uterus or vagina. In two others, which were diagnosed inoperable carcinoma of the ovary at operation, there was probable extension to the uterus, but as the specimen was not removed this could not be proved. Of the remaining 4 cases with bleeding, 1 was a fibroma, 1 an adenocarcinoma and 2 cystadenomas. In none of these cases, however, was there profuse recurring periods of bleeding associated with the tumors of this special group.

In Cases 1 and 4 the uteri were removed and were available for study. In Case 2 the uterus was not removed nor was special mention

made of it in the operative note. In Case 3 the uterus was a multiple fibroid structure and the small ovarian tumor only an accidental finding on section of the ovary. In Cases 1 and 4 the uteri, instead of being the usual senile structures of women long past the menopause, were the size of normal uteri of women in years of active menstrual life, notwithstanding the fact that the patients were sixty-five and sixty-three years of age. This unusual size of the uterus is mentioned by several authors who have reported tumors of this group. The endometria in both of these cases were remarkable. They showed no evidence of senile change compatible with the ages of the patients. In Case 1 the endometrium showed marked hyperplasia (Fig. 1). In Case 4 most of the endometrium was involved in the carcinomatous growth. Between the carcinomatous areas, however, were areas of dilated nonmalignant glands, suggesting that hyperplasia had preceded the carcinoma (Fig. 12). The history of bleeding for eight years is compatible with this view, for certainly the carcinoma which had not yet invaded the myometrium was not responsible for bleeding over so long a period. Rather may it be assumed that the hyperplastic endometrium was responsible for the bleeding except for the recent continuous, profuse bleeding of the last three months which was undoubtedly chiefly due to the carcinoma. In Case 3 the endometrium showed no evidence of hyperplasia, a fact which is not surprising when one considers the minute size of the granulosal tumor. Whether hyperplasia of the endometrium always accompanies a well-developed tumor of this group we are not prepared to say, but it certainly is a frequent finding. In several cases in the literature the fact that hyperplasia of the endometrium is present is definitely stated. In the other cases, in almost every instance, the statement is made that the endometrium is "thickened," "hypertrophied," "polypoid," or "shaggy," descriptive terms which suggest very strongly hyperplasia. The frequent presence of hyperplasia of the endometrium accompanying these tumors is very suggestive that there is some causal relation between the tumors and the condition of the endometrium, and that bleeding results by virtue of the hyperplastic endometrium. According to our present conception of the pathologic condition known as hyperplasia of the endometrium, it is a disease occurring during the menstrual life of a woman dependent upon pathologic ovarian function. Both Meyer and Schröder, working independently, concluded that it was due to a persistence of follicular influence and an absence of corpus luteum influence. They based this conclusion on considerable pathologic material in which a careful search failed to show any corpora lutea in the ovaries but frequent follicles and follicular cysts. If this theory is correct, its occurrence naturally would be limited to the years in which follicles are present in the ovary, that is, before the menopause. An occasional case is reported within several months

after the final menstruation. This is compatible with the above mentioned theory for, just as a woman undergoing the menopause may menstruate six months or a year after her previous menstruation as the result of the development and final retrogression of a last corpus luteum, so a follicle developing and persisting several months after the last menstruation might be responsible for the development of hyperplasia of the endometrium. So apparently in the case of these tumors occurring many years after the menopause this hyperplastic condition of the endometrium may be produced by a pathologic follicular influence due to the development and growth of a neoplasm resembling in form an aggregation of follicles. Certainly this endometrial condition, as well as the large size of the uteri in old women, speaks for some hormonal influence of the tumor and strengthens the view that their origin is from cells which are, at least genetically, related to the normal granulosa cells.

From the above clinical and pathologic study, certain facts are obtained which may be of distinct value in dealing with postmenopausal bleeding. Everyone has had the experience, in investigating the underlying pathology of this symptom, of being at a loss occasionally to explain satisfactorily the bleeding after carrying out the usual diagnostic procedures. The fact that malignancy somewhere in the genital tract is so frequently responsible for the symptom makes it imperative that every effort should be made to discover the underlying lesion. We have shown above that bleeding may occur with other benign and malignant ovarian tumors as well as with the tumors of follicular structure. Should curettage of the uterus reveal a normal endometrium, the possibility of an ovarian tumor, too small to cause palpable ovarian enlargement, should be considered and the patient kept under close observation. Schiffmann has particularly stressed this point. His opinion has been influenced by several cases coming under his observation in which bimanual examination showed no ovarian enlargement and curettage of the uterus showed a normal endometrium at the time the patient presented herself complaining of bleeding. Subsequently these patients have returned with inoperable ovarian carcinomata which doubtless were present at the time of the original examination, but were too small for detection bimanually. Should curettage, done for postmenopausal bleeding, disclose hyperplasia of the endometrium, the possibility of an ovarian tumor of the folliculoid group should be borne in mind. If bimanual examination fails to detect ovarian enlargement the patient should be kept under observation and as soon as ovarian enlargement is noted should be subjected to a laparotomy, provided there is no contraindication to operation in her general medical condition. This is particularly important because the follow-up of the cases cited above has shown that operation offers an excellent chance for cure in these tumors.

SUMMARY

Three cases of granulosa-cell tumor of the ovary and one of the closely related oöphoroma folliculare have been reported and described histologically. The histogenesis of granulosa-cell tumors has been discussed. Evidence has been produced in the form of an extremely early tumor which would indicate that the probable origin is from embryonic rests of ovarian parenchyma in the medullary portion of the ovary. Clinically, the tumors occur most frequently after the cessation of the menses and are usually associated with bleeding. The importance of early diagnosis and operation has been emphasized, particularly because the tumors are sufficiently benign to offer an excellent chance of surgical cure.

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THE EARLY DIAGNOSIS OF ADNEXAL CANCER

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INCIDENCE

ALTHOUGH cancer of the adnexa is much less frequent than cancer of the uterus it occurs sufficiently often to make it a menace.

Primary cancer of the tube is rare. About 232 cases are on record. It occurred once in 19,439 patients in the Gynecological Service at the University Hospital, Philadelphia (statistics furnished through the courtesy of Dr. C. C. Norris), three times in 30,000 cases at the Bellevue Hospital in New York; five times in 35,000 cases at the Johns Hopkins Hospital in Baltimore; once in 3,844 cases admitted to the Gynecological Service at the Jefferson Hospital since September, 1922. Stübler and Brandess list it as forming 0.45 per cent of all genital cancers, the same rating they give for cancer of the clitoris. Although it appears very rare yet the menace of it is emphasized by the fact that Wharton and Krock reported a series of 14 cases, 5 of which occurred in the Johns Hopkins Hospital, the remainder in neighboring hospitals and all but two in the hands of members of their own staff. In private practice I have had two cases within the past two years.

Cancer of the ovary is much more common. The incidence as given in reports varies considerably, thus at the University Hospital 26 per cent of all ovarian newgrowths were malignant. At the Jefferson Hospital 23 per cent were of that description. Stübler and Brandess' proportion was 28 per cent and Zweifel and Döderlein each had about 10 per cent. Stübler and Brandess note the relative frequency of location in genital carcinoma as follows: cervix, 61.27 per cent; body, 16.04 per cent; ovary, 16.85 per cent; vulva, 2.9 per cent; vagina, 1.97 per cent; tube, 0.45 per cent; clitoris, 0.45 per cent.

Byron and Berkoff note the relative frequency of carcinoma of the uterus and of the ovary as follows: cancer of the cervix, 1.8 per cent; cancer of the body, 0.99 per cent; cancer of the ovary, 0.27 per cent.

Our own statistics at the Jefferson Hospital are as follows: 3,844 patients admitted from September, 1921, to January 1, 1930. Cancer of the cervix occurred in 179, 4.65 per cent; cancer of the body in 37, 0.96 per cent; cancer of the ovary in 26, sarcoma of the ovary in 2, a total of 28, 0.70 per cent.

PROGNOSIS

The prognosis of adnexal cancer is bad. The actual percentage of recovery in the patients on record with primary cancer of the tube

is difficult to estimate but with operation and x-ray combined it is probably not more than 4 per cent.

The prospect for patients with cancer of the ovary is much more favorable, but the percentage of five-year cures is decidedly less than in cancer of the uterus.

Nearly all cases of primary cancer of the tube reach the surgeon in an inoperable stage and the same is true in about half the cases of cancer of the ovary.

Adnexal cancer in the early stage for the most part is revealed by accident, during the course of pelvic operations for other purposes or upon examination of pelvic specimens supposed to be benign. For a reasonable chance of curability adnexal cancer must be found at an earlier stage, because it is so rapidly disseminated; being intraperitoneal to begin with, it is likely that particles of the growth are quickly set free among the neighboring coils of intestine; whether this occurs or not the encapsulating action of the omentum and the vascular drainage from the pelvis toward the diaphragm at a very early stage spreads the disease beyond its primary location.

The follow-up statistics in the reported cases of cancer of the tube are meager. In Wechsler's tabulation of 192 cases he says that only 6 were reported as having had no recurrence three or four years following operation. Wharton and Krock in 14 cases had one 3, one 4 and 5-year cure. The last mentioned patient died five years after the operation apparently from intercurrent illness. Schlaak in 1925 reported that there were only two five-year cures on record. The author's first case died within eight months of the operation and the second one, an early cancer with an excellent chance for a permanent cure, died within a week of the operation. Perhaps the estimate of Beck that the permanent cures from operation and x-ray combined is 4 per cent closely approximates the truth. It is very evident from a study of the details of the reported cases that the poor results have come from late recognition of the disease.

The prognosis in cases of cancer of the ovary is much better. Thus Byron and Berkoff report 79 operations, 53 patients traced, 12 alive, average of 4 years and six months to nine years after operation. Zweifel and Payr report 72 operations, 10 of the patients alive, six for more than five years. Schleyer reports 81 operations, 12 living and well of five-year cases. Norris reports 86 operations, 56 patients traced, 21 alive for three or more years. Stübler and Brandess had 122 operations; 30 are alive and free of recurrence at the end of three years.

Our own results at the Jefferson Hospital have to do with 28 cases, 26 carcinoma, 2 sarcoma. Of these one is untraced; 14 are dead (3 postoperative); 5 are living and symptom-free for less than three years; 5 are living and ailing (repeated x-ray treatment) 18 months and 6 months; 6 are ailing and symptom-free, two for three years, two for four years, one for seven, one for eight years. It should be noted that two of the cases living for more than three years were sarcoma of the ovary—round cell and spindle cell—and curiously enough in each case the attention of the patient was drawn to her condition by the acute pain occasioned by a twist of the pedicle. Although strictly speaking they are not cancers of the ovary their clinical significance is identical. I have two other cases in my series of 115 ovarian cysts which are not listed as malignant. Gross and histologic examination of the tumors after operation failed to show malignancy, yet both died later of a general carcinomatosis of the abdominal cavity. In the first the

symptoms developed so soon after the operation that I am convinced an area of carcinomatous degeneration in the tumor was overlooked. The second patient was stricken rather suddenly about two and a half years after the operation. Although it is not certain I suspect that here also carcinomatous areas in the tumor were overlooked. This patient had had a large ovarian cyst removed six years before we removed the second one and with it the uterus.

It is evident that the treatment of adnexal cancer is not very satisfactory. We may compare the results with those achieved in the treatment of cancer of other parts of the genital tract. In cancer of the cervix treated by operation Graves reported: an operability of 64 per cent; relative five-year cures of from 27.6 per cent to 34.2 per cent and absolute cures of 16.8 per cent to 18.5 per cent. Operation for cancer of the cervix has been displaced by irradiation for the results are just as good or better and the immediate risk is less. Thus Healy reports five-year cures in from 42 to 50 per cent of the cases, the result depending mostly upon the type of cancer cell and the stage of the disease. Ward reports five-year cures in 23.1 per cent of all cases and in 53.1 per cent of operable cases. Clark and Keene in their high amputation of the cervix with the cautery knife with the subsequent and immediate use of radium, report 42.9 per cent of five-year cures. So far as cancer of the fundus is concerned, Smith and Grinnell state that operative treatment in Graves's clinic achieved a relative curability for five years of 61.1 per cent in the early cases and 45.5 per cent in the later ones. Healy has recently reported a curability of 65 per cent in early cases and of 34 per cent in all cases, whether for three or for five years I was unable to determine. Taussig a year ago reported remarkable results in the treatment of cancer of the vulva; of 11 cases 9 remained free of recurrence for a period longer than five years, 81 per cent. Two of the latter women developed a recurrence later and died. This still leaves him a curability of 63.6 per cent.

THE IMPORTANCE OF AN EARLY DIAGNOSIS

As the early diagnosis of cancer is so important for successful treatment and as it seems to present unusual difficulties in cancer of the adnexa, I have undertaken in this paper to inquire: (1) What the early manifestations of adnexal cancer are; (2) why they are so often overlooked; and (3) whether anything more can be done to increase the proportion of cases that fall into the surgeon's hands at an early stage.

The basis for my remarks in addition to the literature upon the subject is an analysis of 28 malignant tumors of the ovary and 1 primary cancer of the tube occurring in 115 consecutive cases of ovarian tumor in the gynecologic service at the Jefferson Hospital from September, 1921, to January, 1930. In this work I have been ably helped by my assistant, Dr. John B. Montgomery.

SYMPTOMS

Age.—We may note at the beginning that adnexal cancer is a disease of late reproductive, menopausal or postmenopausal life.

In Wechsler's series of 192 cases of *tubal cancer*, 53 are stated to have passed the menopause; 66 per cent of the cases occurring between the ages of 40 and 55.

In Byron and Berkoff's series of cancer of the *ovary*, 48 per cent had passed the menopause, but a large proportion (31 per cent) had occurred before the age of 40.

Pain.—As the organs affected are internal there may be no well-marked symptoms such as the bloody discharge so commonly observed in other forms of genital cancer; no disturbance of function as is quickly manifested in cancer of the gastrointestinal and the urinary tract; no "lump" or "sore" to attract the patient's attention as in cancer of the skin or of the breast. Pain is the most common early symptom of adnexal cancer but very often it is not at all distinctive, being mild in degree and varying much in its location and character so that it is attributed not unseldom to innocent causes and regarded with indifference by the patient.

Bleeding.—Pain draws more interest in primary cancer of the tube than in cancer of the ovary because it is associated with a bloody discharge in a large proportion of the cases. In cancer of the ovary, bloody discharge is not a frequent symptom except after the menopause, when it also takes place in a considerable number.

Most writers mention pain as a symptom but dwell more particularly upon an increase in the size of the abdomen, the presence of a mass especially bilateral, loss of weight and ascites. Bleeding is prominently mentioned but almost any menstrual disturbance including delayed, scanty or absent periods have been reported.

The latter have been regarded as evidence of congenital deficiencies in the ovary or of destruction of the ovarian follicles.

In recent years more stress has been laid on pain and bleeding. Strauss says "the onset of ovarian cancer is insidious, usually with pain in the lower abdomen or back or both." Byron and Berkoff mention pain in the abdomen as the most frequent symptom occurring in 51.1 per cent of their cases, but they have noted also in addition that 19 per cent complained of backache, 12.7 per cent of bearing-down sensations, 9.5 per cent of dysuria and 3.1 per cent of painful defecation.

The significance of postclimacteric bleeding as an indication of ovarian newgrowths has been dwelt upon of late by a number of writers, notably Robert Meyer, Schiffman, Neuman, Novak and TeLinde. The recurrence of bleeding from the uterus is supposed to result from a renewal of the ovarian function. This stimulation to renewed activity has been ascribed especially to the so-called granulosa cell carcinomata and is evidenced by hypertrophy of the uterine body and a thickening of the uterine mucosa.

Robert Meyer reports seven cases. All of the patients were past the menopause. No definite statement is made of bleeding, but one may presume that it existed. The striking fact in all was the enlargement of the uterus (one of them contained a myoma) accompanying these ovarian tumors in postclimacteric life.

In our series pain was present in 78 per cent; but it was not the outstanding complaint; i.e., the symptom that brought the patient to us, except in a few. Nevertheless a review of the histories showed that in a majority of the cases pain had been the first symptom. But it was very often slight and very often connected with the function of the intestines or the bladder and so escaped the serious attention of the patient.

In 41 per cent of the postclimacteric cases in our series uterine bleeding was a prominent symptom and usually the one that actuated the patient to seek medical advice.

Before the menopause pain and bloody leucorrhea are easily referred to diseases of the reproductive period. During the menopause their significance to the patient may be obscured by the idea that as she is "changing" almost any pelvic disturbance may be expected. After the menopause the symptoms are much more striking especially if the bleeding and the pain are in combination.

Both Wechsler, and Wharton and Krock speak of pain as an early and constant symptom in cancer of the tube. Wechsler in his review of the literature finds that it occurs in the hypogastric, iliac, or lumbar regions, on the same side as the disease, and that it has been described as pulling, pressing, sticking, boring, lancinating, or cramp-like (the latter is most prominent); the pain is often paroxysmal and usually associated with sudden, profuse discharge from the vagina. He says that cancer of the tubes causes a danger signal much sooner than any other intraperitoneal malignant disease and that when a bloody discharge persists in patients within the cancer age, after a diagnostic curettage with negative findings, it is of extreme significance and attention should be directed toward the adnexa.

He speaks of a discharge as present in the vast majority of cases but the fluid assumes different hues, due to the frequent admixture of blood in various stages of decomposition. It has been described as amber, tea, meat-water, brownish, rose, or definitely bloody; the typical syndrome of hydrops tubae profluens appears in from 10 to 25 per cent of cases.

The most striking menstrual symptom is metrorrhagia in women after the menopause. In Wechsler's collection of 196 cases there were 53 that were postclimacteric. Leucorrhea was a prominent symptom in 9 and metrorrhagia in 30. In Wharton and Krock's series of 14 cases, 5 had passed the menopause and 4 had hemorrhage. Both of the author's patients were past the menopause and had a periodic bloody discharge.

It is not uncommon for primary carcinoma of the tube to advance beyond a curable stage during the course of observation or treatment. In the first one of the author's cases the patient complained of pain and bloody leucorrhea fully eight months before unmistakable evidences of adnexal cancer had made their appearance.

That such misfortunes have taken place before is evident from reports in the literature.

Bültemann reports a fifty-year-old woman in whom the operation was done 16 months after she came under observation. A diagnostic D and C had been performed immediately and then x-ray treatment in full castration dose on three occasions. Heil operated in November of 1924 on a woman of 46 in whom a simple

ovarian tumor had been known to exist since 1912. Severe hemorrhage and watery discharge started in January of 1924. Scott and Oliver report a case of watery and bloody discharge 12 years after the menopause. Curettage was negative. Symptoms continued and 11 years later operation showed carcinoma of the tube. Cameron reports a case in which a hysterectomy was done simply because a diagnostic curettage was impossible on account of a very narrow vagina. Barrows reports a case in which a posterior colpotomy within 4 months of the onset of symptoms was negative. An adnexal mass appeared on the left side within the succeeding 4 months. LeBalle and Patay in the report of an advanced case admit that they had not understood the significance of transuterine discharge of water and blood.

Ovarian cancer also is easy to overlook. The danger of doing so even in the presence of postlimacteric hemorrhage is well illustrated in three cases reported by Schiffman. We may mention the first as an example; the uterus was removed by vaginal hysterectomy on account of bleeding. It showed no evidence of malignancy and nothing abnormal was observed in the adnexa. Two years later the patient died with an advanced malignant tumor springing from the left side.

In another patient 70 years old, several days' bleeding had occurred eighteen years after the menopause. This was repeated eleven months later and four weeks before her admission to the hospital. Curettage showed hypertrophy of the uterine mucosa but no malignancy. Laparotomy revealed a carcinoma of the right ovary. In a third case, aged fifty-three, and three years past the menopause, there had been slight irregular bleeding. Curettage elsewhere had been negative. A few weeks later Schiffman did an exploratory section and found an ovarian carcinoma. The patient died and an autopsy revealed metastases to the brain.

One must not forget also that cancer of the ovary may be metastatic (as in 20.75 of Mayer's series) from the stomach, intestines, breast, etc., and that the history of previous or existing cancer in those parts may point the way to an earlier recognition of cancer of the ovary.

In our series of malignant ovarian tumors, an abdominal enlargement had been noted in 17 and was the principal complaint. The duration of symptoms—but this applies mostly to pain—had varied: in three it was only two weeks; in six less than six weeks; in six not more than twelve weeks; in seven the symptoms had gone on for a long time, i.e., seven months to two years, in six it was indefinite but probably of some length. An individual analysis of the cases showed some other interesting and instructive facts as follows:

In two cases a twisted pedicle with acute pain revealed sarcoma of the ovary at an early date. Both of these patients are alive, one seven, one eight years from the time of operation.

Two of the patients were aware of an abdominal tumor for years before surgical treatment was accepted. In the first operation had been repeatedly refused; in the second an abdominal tumor had been diagnosed as myoma and treated with the x-ray.

In one case the patient had had intrauterine irradiation for uterine cancer two years previously, hysterectomy at that time having been refused.

In one case intrauterine applications of radium to control bleeding the first time four years and the second time one year preceding admission had been made twice; no malignancy had been found in the uterus.

Two patients had undergone a radical operation for cancer of the breast fourteen years before the recognition of the ovarian tumor.

One patient had had an entire breast removed twenty-three years before but a positive diagnosis had not been recorded.

Three patients had had an ovarian cyst removed at a previous operation; the first fifteen years before with no record of the diagnosis available; the second four years previously, malignancy having been discovered, the third five months before, the malignancy not having been recognized.

Two patients not listed in this series as malignant died later of peritoneal carcinomatosis; no malignant areas had been found in the laboratory study of their specimens. One of the patients died within nine months, the terminal condition being verified by exploratory section; the other began to complain two and a half years after the operation. No exploratory section or autopsy was performed but the x-ray evidence of cancer of the lungs as well as of the abdomen was unmistakable.

INSTRUCTION OF WOMEN

The first part of an effort to increase the ratio of adnexal cancers that come to the physician at an early stage is such instruction of the laywoman as is needed to make her realize the possible significance of certain symptoms. It is hardly necessary to say anything more relative to the possible meaning of menstrual disturbances, leucorrhea and bloody discharge, although we should continue to remind her of it. But she ought to be advised that as the menopause is approached and for a while after, a periodic examination of the pelvis is desirable irrespective of symptoms and she should be informed that independent of abnormal bleeding or discharge from the vagina, lower abdominal pain of any degree, location or type—intestinal colic, dysuria or dyschesia, deserves thorough investigation. While such information will fill many women with unwarranted mental anxiety, they can be reassured completely, the purpose will be served and medical oversight can be provided.

The success of the endeavor to recognize cancer early is well known. There is no statistical evidence that the death rate has been lowered and it is questionable whether any can be expected. In medical centers it will be higher because more cancer patients go to them for diagnosis and treatment and therefore more are uncovered and treated and a greater number die there. Wainwright, of Scranton, has given definite statistical evidence that certain cancer cases apply to the physician earlier and are referred by him to the surgeon more promptly. He compared conditions at present with those of ten years before. Salzstein of Detroit, reported that at the end of a two weeks' period of intensive lay and medical education some 200 cases of cancer that had not been seen previously by any physician came under treatment. The same thing happened a year later. Fischel in St. Louis had much the same

experience. These facts have been supplied by Howard C. Taylor, President of the American Society for the Control of Cancer, who added, "If you had control, for example, of 100 women who were intelligent and would do as you told them and you were to correct all conditions in them that predisposed to cancer and then instructed them properly relative to the significance of symptoms that might appear and you cautioned them to report any of these conditions at once, is there any doubt that a definite number of these cases would be saved from dying of cancer?"

EDUCATION OF THE PHYSICIAN

What about the physician himself? Is he appreciative of what the early symptoms of adnexal cancer may be? Has he been sufficiently impressed with the fact that pain in the lower abdomen, not constant, not severe, often attributed by the patient to intestinal indigestion or bladder trouble or constipation calls for a searching examination of the pelvis? Has too much stress been laid in our teaching on abdominal enlargement, and a palpable mass in the pelvis as indicative of adnexal cancer?

I recall a physician's niece—she lived next door to him; for more than a year he had been giving her tablets for "intestinal indigestion"; there were no other symptoms; menstruation was normal. Finally the patient observed abdominal enlargement. Then for the first time an examination was made; the pelvis and abdomen were diffusely involved; ascites was present and nothing availed.

The physician should not only act at once when he is told of lower abdominal or pelvic pain but also in his contact with patients inquire for it, and advise without alarming, periodic interrogation and pelvic examination of all women at the cancer age.

PALPATION OF THE ADNEXA

When once the suspicion is aroused our chief diagnostic method is palpation of the adnexa. Unfortunately the parts are not accessible to direct inspection, curettage or biopsy, the patients are often difficult subjects for palpation of the ovaries and tubes; women at the time of life when the incidence of adnexal cancer is greatest usually have a fat abdomen, a thick omentum, good sized epiploic appendages and some contraction and loss of pliability of the vaginal vault. In quite a number of them without doubt it is impossible to say with certainty whether or not there is anything abnormal within the pelvis.

DANGER OF RADIUM

When the chief symptom is bleeding unless there is a ready explanation below the uterine cavity, diagnostic curettage is usually advised. If nothing malignant is found in the uterus and no enlargement of the adnexa can be made out, it is quite customary to apply

radium. In chronic metritis with and without benign hyperplasia of the endometrium and high blood pressure, this is a satisfactory plan. But the use of radium is attended with risk especially in patients beyond the menopause, if we forget the necessity of a careful study and observation of the patient beforehand, otherwise disorders of the adnexa will sometimes be overlooked.

Bleeding after the menopause with a small uterus and an atrophic endometrium is found in tubal cancer particularly. Bleeding after the menopause with enlargement of the uterus and hypertrophied endometrium especially suggests ovarian newgrowths. If radium is applied in either case on the strength of a negative curettage alone we may mask a continuance of a malignant adnexal disease.

Our attitude toward the use of radium as supplementary to curettage, whether it has shown endometrial hypertrophy or not, must be a conservative one. When we are in doubt as to the existence of adnexal disease, it will be better to defer the radium and trust to curettage alone for the relief of symptoms; meanwhile repeatedly observing and studying the patient.

POSSIBILITIES

There is a brighter side to the prospect for the adnexal cancer patient if the tumors are discovered early. This is the mark at which we aim. For example, Stübler and Brandess figured that of their unilateral and operable malignant tumors there was a curability of 55.3 per cent and Norris reported that in his series nearly 60 per cent of the cases that had appeared favorable at the time of operation survived for three years. In addition to operative removal as complete as is compatible with the condition of the pelvic organs and the general state of the patients, we have the help of postoperative x-ray treatment. Keene, Pancoast and Pendergrass show the results of such treatment in a report of 24 cases following exploratory section or operation for carcinoma.

In six an exploratory section only was possible, five of these had died at the time of the report and the sixth was dying. In 18 a partial or complete excision had been performed. Eleven died from two and one-half months to four years later, 7 were alive at the time of the report for varying periods of from seven months to four and one-half years. The authors conclude that irradiation often helps, but that it is impossible to predict its effect in a given case.

CONCLUSIONS

1. The prognosis of adnexal cancer is bad unless the disease is discovered at an early date.
2. The early symptoms of cancer of the adnexa are easy to overlook and in some instances definite enlargement of the adnexa cannot be demonstrated.

3. The prospects of cure improve directly in proportion to the stage of the disease although certain types of cancer are less favorable than others.

4. For the purpose of detecting the disease early the laywoman should be encouraged to report lower abdominal distress or discomfort of any sort as well as irregular bleeding or leucorrhea.

5. In under-graduate and post-graduate instruction more emphasis should be placed on the early symptoms of cancer of the adnexa and less on the late ones.

6. Periodic pelvic examination of women at the cancer age should be made, the examiner not focusing his attention too exclusively on the uterus and the external parts.

7. Repeated pelvic examination and continuous observation and study of the patient should be made in suspected cases if nothing is found at the first visit.

8. Examination under anesthesia may be advised in doubtful cases.

9. True ovarian tumors or any intrapelvic tumor of doubtful character should be removed without delay when the general condition of the patient is favorable.

10. Women who have had carcinoma elsewhere especially should be questioned and examined at regular intervals.

11. All ovarian tumors removed at operation require a painstaking laboratory study, and thorough postoperative irradiation should be employed in all positive and suspected cases.

12. Complete intraabdominal palpation and exploration is to be recommended when practicable during the course of operation for an ovarian tumor even though it appears to be benign.

13. When postlimbacteric bleeding and discharge continue from the uterine cavity in spite of negative curettage for evidences of uterine malignancy, especially if there is pelvic pain or the bloody discharge is periodic, one may suspect an adnexal cancer; palpable enlargement of one or both sides under such circumstances warrants an exploratory incision.

14. When after careful study adnexal cancer is strongly suspected and yet no definite evidence of adnexal enlargement can be found upon palpation, exploratory section must come up for consideration. The ease of examination in the individual case has an important bearing on the decision. If the patient is thin and palpation of the affected parts is easy, the chance of overlooking an early cancer is small and one may rest content with watchful waiting. When the woman is fat and the examiner cannot be certain that he palpates definitely the ovary or the tube but suspects adnexal enlargement, exploratory section ought to be advised but only after the most complete study, con-

sultation with another gynecologist and a reliable internist, and a full explanation of the situation to the family and sometimes to the patient.

15. Caution should be observed in the use of radium for the purpose of stopping hemorrhage from the uterus when the reason for the symptom is not clear. This will apply especially to the postelimaetric period when the uterus and mucosa are hypertrophied and we suspect a cancer of the ovary or when the uterus and the endometrium are atrophic and we suspect a cancer of the tube.

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1827 SPRUCE STREET.

THE TREATMENT OF SALPINGITIS BY LOCAL INJECTION OF TURPENTINE

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THE high incidence of salpingitis among the patients admitted to the wards of any general hospital justifies the discussion of anything new in the manner of treatment. In the Scandinavian clinics, according to recent articles, the percentage of salpingitis runs almost to 40 per cent. In my own service in Montreal, from 1920 to 1924, 15 per cent of 2,100 cases were admitted for salpingitis. In the following five years only 11 per cent of 2,800 cases were admitted with the same diagnosis. To my mind the reason for this is that the cases were earlier recognized, thanks to the broad-minded action of the Quebec Government in establishing their venereal clinics and also to the fact that a change in treatment of the acute cases, particularly the use of nonspecific protein therapy and the discard of the tampon, have materially decreased the number of acute infections going on to salpingitis. During the same two periods of five years, I find an increase in the expectant treatment from 38 per cent to 50 per cent and a decrease in radical operations from 31 per cent to 18 per cent. It is noteworthy that these two series, 68 per cent and 69 per cent, respectively, leave approximately 30 per cent of cases which were treated by operation other than hysterectomy.

It is to be remembered that up to the time of Lawson-Tait in 1870, absolute conservative therapy carried with it a mortality of about 50 per cent. It is possible that only the worst cases were recognized, as the gonococcus had not as yet been identified and there is no doubt that for a time radical operation improved these results. About 1900 the desirability of operation in the acute cases was questioned and in 1909 Simpson² read before this Society his epoch-making paper on the value of delay in operation yet even today ultraradical treatment, removal of the uterus and both tubes, seems to be the preferred method of dealing with those cases not yielding to expectant measures.

At the British Congress in Manchester in 1927, it was noteworthy that most of the English and Scotch gynecologists favored operative therapy, from early operation to operation when safe, and even the most optimistic believers in expectant treatment admitted the necessity for radical operation in a fairly large percentage of cases.

Blair Bell³ suggests that the conservation of the genital functions of the female, even though conception be impossible, is a surgical ideal, but claims that in only a small percentage of cases can the ovary be retained.

My reason for bringing before you this series of cases is to prove that in the vast majority of cases the ovaries may be safely conserved even when operation is undertaken in the acute stage. Operation, other than in the acute stage, is usually highly irrational. One side alone was frequently removed despite the knowledge that infection would in all probability recur on the opposite side, and to this has been added the evidence of Sampson as to the further danger of endometriosis where salpingectomy is done. It is well known that salpingectomy alone carries with it grave danger of involvement of the ovarian blood supply on the affected side.

One difficulty in dealing with this question is that though we speak of salpingitis as if it were easy to diagnose, such is not the case, at least such is not the case in Montreal, for my surgical colleagues admit a 20 per cent to 25 per cent error in diagnosis of female patients admitted for appendicitis. It is easy to say that acute salpingitis should not be operated upon, but consider the problem of the surgeon who opens the abdomen of some young woman and instead of an acute appendix finds an acute fallopian tube. A great deal of self-control is necessary to avoid doing something, and the results of some of the British gynecologists in dealing with salpingitis in the acute stage might be held to justify the removal of one or both tubes. Any attempts to dissuade from immediate operation, on the basis of the report of Aldridge⁴ which appeared recently, dealing with the imperfect healing of wounds, excessive morbidity and mortality, shock and sepsis, are not, I believe, borne out by the results of Cameron and others who advocate operation in the acute stage. The most important problem in connection with salpingitis is the conservation suggested by Blair Bell which, however, is not achieved by the Bell-Beuttner operation.

I have already mentioned the use of nonspecific protein therapy in cases of acute salpingitis. This treatment was the result of observations of Klingmuller⁵ of Kiel in 1918. While not specially dealing with gonococcus infection in females, Klingmuller noted marked improvement in certain patients with gonorrhea while undergoing treatment for other conditions, by means of intramuscular injection of small quantities of essential oil. This was undoubtedly due to general stimulation of the body tissues and was the basis of much further work, notably by Zoeppritz,⁶ Sonnenfelt,⁷ Kronenberg⁸ and others who, while not claiming everything for the method of treatment, decided that it was at least harmless, and in many cases did good. About the same time Brewitt⁹ reported twelve cases in which he had used similar inoculations directly at the site of the maximum evidence of infection, notably into the tubes. Brewitt's technic was to inject four or five cubic centimeters of a 10 per cent solution of turpentine in paraffin oil into the lumen of the tubes and also into their fused fimbriated ends after previous aspiration of pus. Any adhesions were released

and the omentum was brought down to Douglas' culdesac and fixed in such a manner as to separate the pelvis from the peritoneal cavity. All twelve cases recovered satisfactorily without much rise of temperature and their general condition was improved at once. On subsequent examination, four or five weeks later, the masses had disappeared, the uterus was mobile and the appendages were only slightly tender. Three of the twelve cases subsequently became pregnant.

Impressed with the success of the nonspecific protein therapy, in my own and other clinics, in the more acute gonorrheal infections, I started some ten years ago to try out the method suggested by Brewitt, but with a slightly different technic. The abdomen was opened in the midline, the peritoneum being protected by rubber sheeting, and the adhesions were then carefully released, either with the finger, or with blunt dissection. Tubal masses, when present, were evacuated by means of a syringe with a fairly large needle, after which the syringe was changed and the same needle used to inject a variable quantity of 10 per cent turpentine and oil. No attempt was made to prevent this solution from exuding into the pelvic cavity. The omentum was not brought down as Brewitt had suggested, but in each instance the uterus was suspended either by the Olshausen or the Baldy-Webster method. In some of the earlier cases catgut was used in making these suspensions, but I soon learned that the only satisfactory ligature for any suspensory operation was silk. Incidentally the appendix, involved in most of the cases, was removed in practically all.

In all, over two hundred such operations have been done, with only two deaths, but I wish to present certain features of the first seventy-five of these which have now stood the test for approximately five years.

I might say that at the British Congress of Gynecology and Obstetrics in 1927, Miss Ivens¹⁰ reported a series of sixty cases treated with antigonococcal serum after opening the abscesses and mopping freely with normal saline. Her results compared more than favorably with other methods employed, but aroused little comment. The method I have been employing and that employed by Miss Ivens are very similar, but to use Miss Ivens' own statement, "antigonococcal serum to be efficacious must be used early, while the turpentine injections are as satisfactory in the chronic as in the acute cases." I would also mention that other fluids have been noticed as having favorable effect when injected: Nahmacher,¹¹ iodipin; Schmitz,¹² lipiodal; and Davis,¹³ mercurochrome.

While the exact method of operation of these substances remains doubtful, in a number of our cases very profuse uterine discharge was noted three to four days subsequent to the injection and it would appear as if a stoppage of the lumen of the tube at the uterine end had

TABLE I

| HOSP. NO. | COMPLAINT | GONOCOCCUS | CONDITION FOUND | RESULT | |
|-----------|---|------------|--|---|---------------------------------------|
| | | | | Immediate—Improved. | Afebrile. No pain. |
| 3370 | Pain in abdomen; weakness. | Yes | Very dense adhesions; pyosalpinx. Hysterectomy would have been unsatisfactory. | Later—Pelvis O.K. | |
| 5662-22 | Pain in back and lower abdomen. Bleeding. | No | Tubes closed. Left ovary size of pigeon's egg. R. test negative November 23. | Immediate—Improved. Pelvis O.K. | Pelvic ex. negative. |
| 4805-22 | Pain in lower abdomen. Purulent discharge. | Yes | Right tube densely adherent. Left tube densely adherent to ovarian cyst. | Immediate—Improved. Clinically O.K. | No left not tender. Better than ever. |
| 3382-22 | Heavy dragging pain L.L.Q. | Prob. | Left hydrosalpinx. Right tube closed not distended. | Later—1/9/24. Much better. | No pain in tenderness. |
| 5492-22 | Dyspareunia. Leucorrhea. | | Right hydrosalpinx. Left hydro-salpinx. | Immediate—Improved. No mass. Uterus mobile. Fullness on left. Right O.K. | |
| 5753-22 | Pain in left and right lower quadrant. Pain in right hip. | Yes | Tubes red and inflamed, left closed. | Later—1/12/23. No pain since. Slight thickening on left. | Slight tenderness |
| 2504-24 | Pain in right lower quadrant. | Yes | Left tubo-ovarian mass. Right tube tortuous and fixed. | Immediate—Improved. No mass. O.K. | No pain. |
| 3406-23 | Pain left lower quadrant. Leucorrhea. | Probable | Large tubo-ovarian mass. | Later—Nov., 1925. Profuse leucorrhoea. No pain. | No tenderness. |
| 2612-23 | Pain lower abdomen; fever; nausea; menorrhagia. | Yes? | Tubes enlarged, boggy in culdesac. | Immediate—Improved. Tenderness both fornices. | No tenderness. |
| | | | | Later—Aug., 1923. No pain tubes. Sept., 1923. Free from pain. Soft mass in culdesac. Dec., 1923. No complaints. | |
| | | | | Oct., 1926. Negative pelvis. | |
| | | | | Immediate—Satisfactory. | |
| | | | | Later—Oct., 1923. No better. | TBC? |

TABLE I—CONT'D

| HOSP. NO. | COMPLAINT | GONOCOCCUS ? | CONDITION FOUND | RESULT |
|-----------|--|--------------|--|--|
| 4099-23 | Pain in lower abdomen. Leucorrhea. | | Uterus retroverted. Left ovarian abscess. Left tube dilated. Right swollen and tortuous. | Immediate—Improved. Pelvic mass felt under anesthetic. Following examination temperature fell. Later—Sept., 1923. Improved. Right hydrosalpinx. Left clear. |
| 4192-23 | Pain right lower quadrant. | | Both tubes occluded. Left fixed to ovary. | Immediate—Improved. Slight thickening both tubes. No tenderness. Later—July, 1924. No pain since. Small left sided mass not tender. Menses regular. Nov., 1925. No tenderness, pain or mass. |
| 472-23 | | No | Right ovary cystic, tube occluded. Left tube partly patent. | Immediate—Improvement good. Later—Sept., 1924. Condition excellent. |
| 1611-25 | Pain in lower abdomen. | Probable | Old and recent adhesions. Tubo-ovarian mass left. | Immediate—Improved. T.O. masses smaller. Later—Nov., 1925. Slight tenderness on movement of uterus. No mass. Pre-menstrual pain only. |
| 1182-25 | Pain in lower abdomen. Leucorrhea. | | Old adhesions both sides. Right tube occluded. Left tube glued at fimbriated end. | Immediate—Improvement good. Later—Nov., 1925. Much improved. No masses. Able to work. Slight tenderness over appendages. |
| 3125-25 | Pain in right lower quadrant. | | Tubo-ovarian mass left. Pregnant uterus. | Immediate—Improvement good. Slight tenderness over left appendages. Later—No mass felt on left. No pain. Patient complains of slight pain on right but no mass is felt. Oct., 1926. Negative pelvis. Live baby full term. Improved. |
| McK-1925 | Menorrhagia. | No | Dense adhesions due to tuberculousis. | Later—Nov., 1925. No pain. Much more comfortable. |
| 2858-25 | Vaginal bleeding. Pain in lower abdomen. | Prob. | Large tubo-ovarian mass right. Left chronic tube—adherent to ovary. | Improved. Slight tenderness on left. Lost. |

TABLE I—CONT'D

| HOSP. NO. | COMPLAINT | GNOCOCOCCUS | CONDITION FOUND | RESULT |
|-----------|--|-------------|--|---|
| 509-24 | Pain in back and R.L.Q. Leucorrhea. | No | Cystic ovaries, no adhesions. Tubes kinked. Uterus retroverted. Early ectopic right. | Improvement good. Later—Aug., 1924. O.K. |
| 1076-25 | Irregular bleeding. Leucorrhea. | No | | Improvement excellent. Later—Nov., 1925. Negative pelvis. |
| 2542-25 | Pain in lower abdomen. | Prob. | Appendages adherent in culdesac. Uterus retroverted. | Improvement excellent. Later—Nov., 1925. No pelvic pain. Uterus freely movable—no pain. |
| 4470-25 | Pain in left lower quadrant. | No? | Right tube thickened. Left occluded by adhesions. | Improved. Tenderness over appendages, but no pain. |
| 1158-25 | Discomfort in lower abdomen. Leucorrhea. | Possible | Left tube closed by adhesions. Right hydrosalpinx. Cystic ovary. | Lost. Improvement good. Later—Nov., 1925. No pain. Menses. Some thickening on left. |
| 4059-24 | Pain in abdomen. Vaginal bleeding. | Prob. | Right tube thick and tortuous. Left tube less thickened. | Improvement good. Later—Oct., 1925. Pain in back lately and discharge. Right tube is behind uterus, tender. |
| 3428-24 | Pain in lower abdomen. Metrorr. and menorrhagia. Leucorrhea. | Prob. not | Very few adhesions about tubes which were patent. | Improvement good. Later—No tenderness in pelvis. |
| 3037-24 | Pain in lower abdomen. Leucorrhea and constipation. | No | Little evidence of P.I.D. Left tube hydrosalpinx. Right ovary cystic. | Improvement good. Later—Jan., 1926. No tenderness. No dysmenorrhea. Tubes palpable, but not tender. |
| 2888-25 | Pain in lower abdomen. Metrorrhagia. | Yes | Unruptured ectopic right. Subacute salpingitis left. | Improvement fair, febrile, no tenderness. Later—Aug., 1925. Pelvis negative. |
| 5746-22 | Pain in right lower quadrant. | No | Both tubes very red. Right ovary cystic. | Much improved. Later—Jan., 1927. Condition O.K. |
| 5265-22 | Pain left costal margin. Abdominal pain. | ? | Tubes red and patent. Uterus retroverted. Some adhesions. | Improved. No pain. Later—Aug., 1923. No pain since. Pelvis clear. |
| 4637-22 | Pain in lower abdomen. Bleeding. | | Uterus retroverted. Left hydrosalpinx. Right pyosalpinx. | Improved. No pain on movement of uterus. No mass. Later—Dec., 1923. O.K. |

TABLE I.—CONT'D

| HOSP. NO. | COMPLAINT | GONOCOCCUS | CONDITION FOUND | RESULT |
|-----------|--|------------|---|--|
| 4555-22 | Pain in R.L.Q. | Prob. | Large right tubo-ovarian mass. Many adhesions on left. | Improved. No pain on movement of uterus. Right side O.K. Left tube palpable. Later—Nov., 1925. O.K. until last 6 mo. when she has had pain. Left tube enlarged (married at time of recurrence). Improved. No tenderness or fluid. Later—Jan., 1923. Excellent. No pelvic inflammation. Improvement good. Later—March, 1923. Uterus drawn to left, rather firmly fixed. Nov., 1925. Able to work. Occasional pain. Pain not relieved. Later—Renal calculus removed. Improved. Excellent. No pain. Later—Nov., 1925. No pain or tenderness. Negative pelvis. Improved. Some tenderness high on left side. Later—Nov., 1925. Pelvis negative. Improved. No pain. Lost case. Improved. No tenderness. Slight thickening on left. Later—Oct., 1923. Well. Anatomically O.K. Improved. Left appendages palpable. Not tender. Lost—did not return to out patient department. Improved. Appendages thickened but not tender. Later—Dec., 1923. Feels better. Still has profuse leucorrhœa. |
| 3555-22 | Pain in R.L.Q. (D & C). Leucorrhœa. | | Tubes tortuous. Ocluded filled with clear fluid. | |
| 60-23 | Pain in R.L.Q. Vomiting. | Prob. | Tubes injected. | |
| 3663-23 | Pain in R.L.Q. Dysmenorrhœa. | | Tubes congested but patent. | |
| 1881 | Premenstrual vomiting. Lower abdominal pain. | | Double hydrosalpinx. | |
| 4270-23 | Leucorrhœa. Recurrent abd. pain. | | Adhesions both sides. Tubo-ovarian mass on left. | |
| 6313-23 | Pain in lower abdomen. Leucorrhœa. | | Adhesions in culdesac. Tubes injected. | |
| 4920-23 | Pain in left lower quadrant. | | Adhesions between tubes and ovaries. | |
| 4908-23 | Pain in lower abdomen. Leucorrhœa. | Yes | Adhesions both sides. | |
| 4505-23 | Pain in lower abdomen. Yellow discharge. | Yes | Right pus. 10 c.c. pus in tube. Left tube ocluded. | |

TABLE I—CONT'D

| HOSP. NO. | COMPLAINT | GONOCOCCUS | CONDITION FOUND | | RESULT |
|-----------|--|------------|---|---|--|
| | | | Left tube tortuous and swollen. Right tube tortuous and more distended. | Right tube occluded. | |
| 4773-22 | Pain in lower abdomen. | No | | | Improved. Mobile without pain. Slight tenderness in culdesac. Right free. Later—Tender left side. No pain. Improved. Slight fullness of left appendages. |
| 1231-23 | Pain in R.L.Q. Disturbance of menstruation. | | | | Later—Nov., 1925. No pain. Menses regular. No tenderness or masses. Improved. No pain. |
| 3994-23 | Bleeding. | | | Right tube size of hen's egg. Left occluded. | Improved. Febrile on discharge 1927. Patient well. O.K. |
| 3516-23 | Pain in lower abdomen. | | | Uterus retroverted. Abscess right ovary 2 oz. pus. Left tube large and edematous. | |
| 4559-23 | Pain left lower quadrant. Leucorrhea. | | | Uterus retroverted. Right tube tortuous, patent. Left tubo-ovarian mass. | Improved. Appendages not tender. Thickening on left. Case lost—did not return to out patient department. |
| 4280-23 | Pain lower abdomen. Profuse leucorrhea. | | | Left hydrosalpinx. Right adhesions. | Improved. Tender mass on right. Smaller mass on left. |
| 4347-23 | Pain in lower abdomen. Leucorrhea. | | | Tubes fairly normal. Right occluded. Ovaries cystic. | Later—Sept., 1923. No pain. Improved. Some tenderness left fornix. Some white discharge. Later—Did not return to out patient department. |
| 4329-23 | Irregular menses. Profuse leucorrhea. Pain in lower abdomen. | Yes | | Very dense adhesions. Right pyosalpinx. Tubes tortuous. | Improved. Tenderness gone. Later—Oct., 1923. No pain. Better than ever. Miscarriage 1 year after. Oct., 1926. Negative pelvis. |
| M-23 | Pelvic pain. | ? | | Adhesions involving both tubes and suggesting chronic salpingitis. | Nov. 6, 1925. Tubes palpable. No pain. Endocervicitis some days. Pregnancy with abortion, 1926. |
| 5241-25 | Pain in lower abdomen. Leucorrhea. | | | Bilateral hydrosalpinx. Right salpingo-oophorectomy. | Nov., 1925. No pain. Left appendages slightly tender. |
| 2687-24 | Pain in epigastrium and left lower quadrant. Gas. | | | Bilateral hydrosalpinx. | Nov., 1926. No pain since. Negative pelvis. |
| 915-26 | Pain in lower abdomen. Bleeding. | | | Left tube distended. Right edematous. Pregnant uterus? | Immediate—Uterus mobile. Left appendages palpable. Right O.K. |

TABLE I—CONT'D

| HOSP. NO. | COMPLAINT | GONOCOCCUS | CONDITION FOUND | RESULT |
|-----------|--|------------|---|---|
| 1971-26 | Pain in lower abdomen. | | Tubo-ovarian mass right. Left tube adherent. | Immediate—Patient died of peritonitis. |
| 267-26 | Pain in lower abdomen. Menorrhagia. | | Tubo-ovarian mass left, size of golf ball. Right injected. | Immediate—Negative pelvis. |
| 3095-26 | Abdominal pain. | | Tubes inflamed. | Immediate—Uterus mobile without pain. Later—Jan., 1927. Pelvis negative. Feeling fine. |
| 4066-26 | Pain in R.L.Q. | | Adhesions both sides. Right hydrosalpinx. | Immediate—O.K. |
| 2805-22 | Pain in lower abdomen. | | Bilateral tubo-ovarian masses. | Later—Dec., 1926. Negative pelvis. Immediate—Uterus mobile without pain. Appendages not felt. |
| 4280-26 | Pain in lower abdomen. | | Uterus retroverted. Tubes relatively free. | Immediate—No tenderness in pelvis. Later—Jan., 1927. Negative pelvis except for palpable right appendages. |
| 62-26 | Pain in lower abdomen. Leucorrhœa. | | Uterus retroverted. Pyosalpinx both sides. | Immediate—Uterus mobile. No pain. |
| 1676-26 | Leucorrhœa. | Yes | Right tubo-ovarian mass 5 cm. thick. Left tube 75 c.c. pus withdrawn. | Later—Patient did not return. Immediate—Uterus forward fixed. Large mass on right. Not tender. |
| 4844-26 | Pain in left lower quadrant. Metrorrhagia. | | Dense adhesions. | Later—Thickening both appendages. No tenderness. |
| 5024-26 | Weakness; discharge. Difficult urination. | Yes | Large pyosalpinx both sides. | Immediate—O.K. Later—Uterus mobile. No pain. Dec., 1926. Jan., 1927 uterus back causing pain. |
| 4174-26 | Pain in lower abdomen. | | Tubo-ovarian mass right (out). | Immediate—Uterus fixed in front with large mass. No tenderness. Later—Dec., 1925. Right side clear. Left non-tender mass. |
| 2593-26 | Pain in right lower quadrant. | | Tubes seem O.K. Large ovaries. | Immediate—Right side free. Left tubo-ovarian mass not tender. |
| 5414-26 | Sore abdomen. | | Bilateral masses. | Later—Jan., 1927. O.K. Immediate—O.K. Later—O.K. Immediate—Uterus mobile with some pain. Mass on right not tender. |

TABLE I—CONT'D

| TABLE I—CONT'D | | | RESULT |
|----------------|-------------------------------|------------|--|
| HOSP. NO. | COMPLAINT | GONOCOCCUS | CONDITION FOUND |
| 5495-26 | Bleeding from vagina. | No | Tubo-ovarian mass left. |
| 5478-26 | Bearing down pain. | | Bilateral hydrosalpinx. Removal left side. Right turpentine suspension. |
| 5327-26 | Pain in lower abdomen. | Yes | Tubes distended. Turpentine to both. |
| 1756-25 | Pain in left lower quadrant. | | Ovarian abscess left. Operation hysterectomy. Left salpingo-oophorectomy. Right turpentine. Left salpingectomy. Left turpentine. Fixation of uterus. |
| 1741-26 | Pain in lower abdomen. | | Left salpingo-oophorectomy. Right turpentine. |
| 1127-26 | Abdominal pain. | Yes | Both tubes distended. 2 c.c. turpentine. Tubo-ovarian mass left. Right tube fused. Left tube adherent to cystic ovaries. Right occluded. Tubes thick 10-20 c.c. turpentine. Intraligament cyst left ovary. Dense adhesions right. Right ovarian abscess. Tube fused. Left tube open. |
| 915-26 | Bleeding. | | |
| 409-26 | Pain in left breast. | | |
| 1390-26 | Pain in R.L.Q. | | |
| 2281-26 | Metrorrhagia. | | |
| 2165-26 | Menorrhagia. Ectopic history. | | |
| 605-26 | Leucorrhœa. | | |

| RESULT | |
|--|--|
| Immediate—Uterus forward mobile. Left appendage large and tender. No pain if not touched. Mass on left. Not tender. Later—Dec., 1926. Uterus mobile without pain. Right app. palpable not tender. Left O.K. Old complaint. Uterus in good position. Right side negative. Left tender. Immediate—Smooth. Later—Dec., 1926. Large cyst mass on left not tender. Uterus mobile. Right side free. Immediate—No tenderness in pelvis. | |
| Immediate—Satisfactory. Later—Left tube palpable not tender. Uterus was fixed, gives some pain with periods. Immediate—Uterus in good position. Appendages clear. Later—May, 1926. O.K. Immediate—Improved. | |
| Immediate—Improved. Later—Jan., 1927. O.K. Immediate—Satisfactory. Later—Satisfactory. Immediate—Satisfactory. Later—Pelvis O.K. Immediate—Satisfactory. Later—Satisfactory. Immediate—O.K. Later—June, 1926. Negative pelvis. | |

been overcome. Certainly the fluid does not remain as such, as I was fortunate in securing, at a subsequent operation for another condition, the tube of a patient who had been "turpented," which in this instance contained a limpid fluid negative to tests for oil and for turpentine.

A brief résumé of each of seventy-six cases is appended. The odd case was added on account of the clinical interest, though not a case of salpingitis. This, a woman who previously had been operated upon for extrauterine pregnancy, was admitted with a mass in the left side and some evidence of mild peritonitis. The diagnosis lay between tubo-ovarian mass and extrauterine pregnancy, but at operation it proved to be an ovarian abscess, together with an intrauterine pregnancy. The large ovarian abscess was evacuated by means of a needle, the pus replaced by the turpentine solution and the patient went to term and was delivered of a normal live child and a subsequent examination showed no evidence of the previous pathologic condition.

The predominating symptoms complained of by these patients were: pain, 61; leucorrhea, 22; bleeding, 19; dysmenorrhea, 2; vomiting, 2.

On examination definitely palpable pelvic masses were noted in fifty-three cases. In only four instances was the presence of a mass not associated with pain. Of the sixty-one patients (80 per cent), complaining of pain on admission, 56 were absolutely free from pain at discharge and have remained so since. Three were definitely improved, two of these noting pain only at the menstrual period. One, a tuberculous case, was no better, and one patient died. It is noteworthy that the pain recurred in those cases where the suspension was not a success. Of fifty-three patients with pelvic masses, thirty-five at subsequent examination had no palpable mass in the pelvis. Thirteen others examined within six months were definitely improved, though the appendages were still definitely enlarged. Of these thirteen, six returned for but one examination, and four others failed to return for even one subsequent examination. The irregular and profuse bleeding was benefited immediately in practically all the cases, though three of the twenty-two were subsequently admitted for recurrence of bleeding, though this was unaccompanied by pain. We have tried in these cases the suggestion of Polak,¹⁴ deep x-ray therapy, and believe that this will give success.

One death occurred in a patient with a large ovarian abscess which had been diagnosed as salpingitis. Here, the body of the uterus and the affected side were removed and the relatively free tube was turpented and retained. This patient died of peritonitis. In the light of present experience I am of the opinion that aspiration of this abscess and the use of turpentine might have been satisfactory, but at that time I was not aware that large quantities, even up to 70 cubic centimeters, could be used without danger of untoward symptoms.

Though not primarily undertaken in the hope that these patients would become pregnant, four did so, though of these three aborted and the fourth was interrupted just before term on account of toxemia of pregnancy. This seems in line with the reports of Ritter¹⁵ of Tübingen, who has given the result of sixty-five cases of salpingostomy with only four subsequent pregnancies, of which one went to term. It would appear that the apparent severity of the infection has little bearing upon the possibility of pregnancy, as may be noted from the following case:

Series 47, R. Came in, in October, 1922, complaining of menorrhagia and metrorrhagia, pain in the lower abdomen and pain on micturition and defecation.

Since the birth of her only child one year previously, the periods have been irregular and for the past two months she has menstruated twice, each time for a period of ten days and has had between times a profuse yellow discharge. The pain is severe and cramp like, irradiating down to the thighs and has been fairly constant. Urination is frequent and painful, the bowels constipated and great pain associated with defecation.

On vaginal examination there was noted a profuse bloody discharge, the uterus forward and fixed, on the left a large tender fluctuating mass and on the right definitely enlarged and tender appendages.

At operation there were extremely dense adhesions involving both the large and the small bowel. Release of the adhesions resulted in damage to the peritoneal coats of the bowel and allowed the escape of free pus.

The tubes were occluded, tortuous, thick and filled with pus and both ovaries were more or less disorganized. The adhesions here were freed as far as possible, the ovaries drawn up behind the uterus, the pus evacuated by means of a large needle and the tubes filled with 10 per cent turpentine and oil. Owing to the extent of the raw area resulting from the freeing of the adhesions, a gauze wick was passed through the culdesac into the vagina. This patient became pregnant twelve months after operation and aborted in February, 1924, a fetus of approximately three months.

Since the adoption of this method of treatment practically all of the general surgeons in the Montreal General Hospital have made use of it and are continuing to do so. Apart from the death above noted and one other associated with generalized tuberculosis accompanied by gonorrhea, there have been no deaths among patients upon whom this treatment was used. In neither was it the cause of death. In the series above recorded there was but one case of infection in the abdominal wound, though more recently we have had trouble, particularly with cases which subsequently proved to be tubercular. It has been used not only in the chronic cases but in the very acute and as noted before up to 70 cubic centimeters of the solution has been injected without ill effect.

May I repeat that none of these women were spayed, that in 90 per cent of the cases they were permanently relieved of pain, that in the vast majority of instances inflammatory masses ultimately disappeared within a period of four to six months, sooner when medical diathermy

was used, that relief seemed to be permanent and in the scattered cases of recurrence it was obviously reinfection from without. The method is simple and absolutely safe and particularly adapted for use in general surgery.

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Original Communications

THE PRESENT STATUS OF THE TREATMENT OF CARCINOMA OF THE CERVIX UTERI*

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THE differences of opinion as to which method of treatment yields the best results in carcinoma of the cervix are more marked today than ever before. On the one hand are Stoeckel, Wagner, Peham, Jaschke and others who operate radically whenever possible and on the other hand the group composed of Doederlein, Menge, Seitz, Wintz, Regaud, Heyman and others who treat uterine carcinoma by radiation therapy only. Furthermore, of those who use surgery, a larger number operate by the vaginal route according to the Schauta technic and the remainder by the abdominal route after Wertheim; some in each group employ preoperative irradiation, some use postoperative irradiation prophylactically and some do not resort to radiation therapy at all. Lastly those who employ radiation therapy are divided into those who use radium, those who use x-ray and the group who combine both methods.

The methods of radiation therapy as employed by the various institutes and clinics are so completely at variance with one another that a fundamental comparison of the results obtained in the several institutions is practically impossible. This statement is concurred in by the radiologic division of the Cancer Commission of the League of Nations. And to this statement must also be added the fact that the ability to control the patient varies greatly; furthermore, as Stoeckel

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has said, there are many marked variations even between patients who have been classified as belonging to the same group. Indeed each author suggests in his own statistics that his individual results are the best and that if the absolute results reported do not bear out this fact, the blame lies not in the line of therapy or technic employed but rather in certain extraneous factors over which the author had no control. It is practically impossible, therefore, for even the most experienced clinician and critic to create for himself an accurate picture of the value of the different methods of treatment as reported in the literature.

Particularly difficult is the task of digging out the true final end-results from the mass of published statistics, all of which are more or less modified and influenced by varying local conditions. The very fact that there are so many variations in the statistical computations must prove that comparisons are practically impossible. This applies equally to a comparison of the results obtained by surgical and radiation therapy, due to the fact that all inoperable patients are referred directly to the radiation department rather than to the surgical division for therapy.

Many of the larger clinics now have departments of radiation therapy and it is therefore becoming easier to compare statistical reports, at least from such institutions. It must remain evident, however, that those clinicians who lean toward surgical therapy, will refer only the inoperable patients to the radiation department for treatment. And so even under these conditions comparisons are, for all practical purposes, impossible.

Until the introduction of radiotherapy, only surgery of the most radical type offered any chance of cure for uterine carcinoma. And since Saunter in 1821 performed the first total extirpation of the pelvic organs for carcinoma of the uterus, there have been devised many methods of radical surgery, vaginal as well as abdominal with this end in view. The best statistics, computed on cases treated surgically, show a clinical cure in from 40 to 50 per cent and an absolute permanent cure in 20 to 25 per cent. These figures are based on all carcinoma admissions and are uncorrected statistics. But the fact must not be lost sight of that these patients were operated upon in the larger clinics by the better trained gynecologists whereas the general results obtained by all practicing physicians must of necessity be much lower. They are lower because many who operate for carcinoma are not skilled gynecologists but general surgeons and practitioners who are for the most part untrained in this type of surgery. Carcinomatous residues in the parametrium are too frequently left behind and the surgery performed is too frequently incomplete to achieve a high percentage of cures. Even cervical amputation has been performed as a cure for carcinoma of the cervix. These facts and the fact that many

obsolete procedures are still being employed are deplorable both from the gynecologic point of view and from that of the patient suffering from carcinoma.

Radiation therapy offered a new method of treatment for carcinoma. At first the results obtained were quite naturally no better than those obtained surgically. Here likewise a technic had to be developed and various methods tried before useful results could be obtained. It cannot be denied that radiation therapy, like surgery, still shows inadequacy both as to methods and technic. And further it must be emphasized and clearly understood that proficiency in radiation therapy is more difficult to achieve than proficiency in surgery. The surgical treatment has for its purpose the wide excision and removal of all diseased tissues. It is performed directly under the eye and yet the surgeons know the frequency with which surprises and disasters are encountered. Radiation treatment on the other hand deals in many instances with the unknown. It is often impossible to determine accurately the extent of the carcinoma and of the tissues involved. Especially is this true in the early cases. Destruction of a deep lying carcinoma after deep radiation therapy can only be assumed, visual control is never possible. The method of radiation therapy to be employed should be determined only on the basis of careful and exact clinical follow-up examinations for each patient. A routine method of radiating all patients suffering from carcinoma is most inaccurate and most undesirable. Complications result even with the most carefully worked out technic just as they do in surgery. It is as difficult to prevent injuries of the bladder, rectum and ureter by one method as by the other. In surgery, incomplete operations are decreasing in frequency but the fear of producing possible injuries by too intense radiation therapy still keeps many radiologists from employing adequate dosages. Complications with any new and involved procedure such as radiation therapy are unavoidable even when competently carried out. They are, however, inexcusable when executed by untrained operators or with inadequate apparatus.

It is of course true that radiation statistics show the best results obtainable to date because they are reported only from radiation institutes which have the best trained therapists for radiation therapy. It must be conceded, therefore, that the average radiation results are somewhat lower than those found in the literature. The average results obtained by irradiation must be lower than those reported only by the best workers in the field. Furthermore, radiation statistics are subject to the same criticisms as are the surgical statistics.

TECHNIC OF IRRADIATION

The radiation therapy of uterine carcinoma must, of necessity, always be of the deep type. It can be successful only if the apparatus is

mechanically equipped for this purpose and further if the roentgenologist is mentally equipped for carrying out the procedure. Radiation therapy can also be successfully carried out by the use of radium, with a minimal amount of 50 mg. of the radium element, although it is desirable to possess between 80 and 100 mg. Quantities of from 3 to 5 gm. such as Forsell, Regaud, DeNobile and Kelly have at their disposal must of necessity always remain exceptional amounts. But this fact is not of great moment, for these excessively large amounts which are used for percutaneous radiation can always be replaced by deep x-ray therapy. The use of such large amounts of radium means in reality the dissipation of large amounts of radiation energy. If the available radium in the world were to be collected and held in such large accumulations it would of necessity limit the number of cases which could receive its benefits. Excellent results are obtainable even with comparatively small amounts of radium when such small amounts are carefully and properly used. While it is true that the gamma rays emanating from radium are definitely harder than those which emanate from x-rays, it is a biologic fact that either type of gamma rays can be made to destroy the carcinoma cells or in fact any cells in the human organism.

The question has never been definitely settled as to whether or not there are carcinomas whose cells are resistant to x-rays and only susceptible to radium. This can perhaps be answered by careful animal experimentation. The superiority of radium irradiation has not been settled to date with any degree of certainty although many authors and workers make this claim. In those cases where radium has produced results following x-ray failure, such results have in all probability been due to a summation effect of the two types of irradiation rather than to the effects of the radium alone. The opposite experience, i.e., where radium had failed and good results were then obtained by the use of radium and x-ray, has also been reported. For example, Zimmerman reports the following case in *Strahlentherapie* (Vol. 29):

The patient had a carcinoma during pregnancy and following the second radium treatment the tumor disappeared completely. The patient then was delivered at term and during the puerperium a section was removed for microscopic examination, which showed the presence of a squamous cell carcinoma. The patient made a complete recovery and cure following a course of radium and x-ray therapy. She remained well and carcinoma-free for seven years.

One must conclude that the cure was here due to the combination of x-ray and radium after the latter, alone, had failed, or more properly that the cure was brought about by means of a summation effect of the two types of treatment. This case is an excellent illustration of the difficulties encountered in attempting to determine whether or not a given carcinoma is resistant to either x-ray or radium. This question can, as a matter of fact, never be definitely settled, until such

a time when a large tumor could be divided in half, the two halves carefully screened, and treating one-half with radium and the other half by x-ray. But even in such a test many sources of error would arise because of the difficulties of regulating the radium effect and the radium dosage. Furthermore, the indeterminable factor of secondary irradiation would enter into such an "ideal experiment" so that the one-half of the tumor would not have a pure irradiation from x-rays nor the other half a pure irradiation from the radium. *

Radiation therapy is favored by the fact that the radium can be placed in the vagina and in the uterine cavity, frequently in direct contact with the tumor or even within its substance. For such procedures, 50 mg. of the element are sufficient for therapeutic results. An operator must work with small doses and small quantities of radium, due to the limited quantities of radium which are available in the world; and for percutaneous radiation, x-ray should be used rather than radium. In regard to its employment in general, it can be said that radium is used to better advantage in localized and small tumors of hollow viscera whereas x-ray can be used with better results and by easier application when the malignancy is spreading by flat extensions in solid tissues. Due to the anatomic conditions present in uterine carcinoma, either x-ray or radium may be used alone or in combination. The combined treatment will, in all probability, yield the best results.

Formerly the indications for treatment were simpler. It was possible to achieve permanent results only through radical surgery; today it is a free choice between surgery, radiation therapy, or surgery combined with irradiation. There are a number of surgical methods available, each with its distinct advantages and disadvantages. It cannot at present be stated which method lends itself best to preoperative irradiation and which to postoperative irradiation. These are new problems which must be studied statistically before arriving at any definite and final conclusions. Our experiences show that the introduction of radiation therapy has complicated rather than simplified the indications for treating carcinoma. For no one can say that radiation therapy has or ever will replace surgery by virtue of its superior results; this ideal goal will never be reached. One must always take into consideration the resistance to radiation which some types of malignancy exhibit, and especially the glandular varieties. The same holds true for carcinomas other than uterine, i.e., ovarian, tubal, gastrointestinal. Here irradiation likewise is of unquestionably definite value under certain conditions; nevertheless surgery with certain rare exceptions offers the only hope of permanent cure. The difficulty in arriving at definite conclusions concerning these problems is well illustrated in volume 29 of *Strahlentherapie* where two well-trained radiologists arrive at diametrically opposed conclusions about uterine car-

cinoma. Heyman of Stockholm describes his own excellent results in 500 cases of carcinoma which were subjected to primary radiation therapy. Bolaffia, formerly of Rome and now in Cagliari, strongly advises radical surgery and denounces preoperative irradiation for any operable cases. A definite answer has, therefore, not been found to the question of radical surgery versus radiation therapy in the treatment of carcinoma of the uterus.

There must be reasons for such diverse opinions as expressed by Heyman and Bolaffia. It is possible that the answer may be found in the type of therapy and in the dosages used. Then, too, northern races exhibit a greater resistance to carcinoma than do southern races; or it may be possible that the carcinomas as found in northern are more benign than those found among the southern races. It has been definitely shown that living conditions play a rôle in the course of carcinomatous patients. This has recently been reestablished at the London meeting of the British Society for the Control of Cancer in 1928 by Greenwood of London, M. Young of London and by Niceforo of Naples.

According to the latest investigations, living conditions would seem to be the determining factor for the studies of Shrewsbury. This author's work, made among the Jews of many countries of the world, disclosed the remarkable fact that the frequency of carcinoma among Jews in various countries varies greatly; further that this frequency is always the same as that of the carcinoma frequency of the country in general. And finally, the statement so frequently found in the literature that native races acquire carcinoma only after they have adopted the standards of living of civilized peoples, is evidence that the mode of living is responsible, together with certain unknown factors, for the appearance of carcinoma. Lastly, there appears to be no racial immunity against carcinoma.

To further explain the opposite end-results obtained by Heyman and Bolaffia, one must also consider the possibility that the type of patients in each report may have differed qualitatively. In the division of patients into operable and inoperable cases there are naturally many deciding factors. These are of course eliminated in the many operative cases which have undergone exploratory laparotomy for diagnostic purposes. It would be most desirable for the sake of comparison if one of the southern European clinics could, for a long period of time, adopt Heyman's technic which has produced such excellent results in the north of Europe. If all cases of uterine carcinoma could be treated by this technic it would then be possible to have an exact method of comparison. Perhaps the Section on Hygiene of the League of Nations might undertake such a problem. It is a lamentable fact that no two authors of the many who have reported the statistics of large series of cases, have ever used the same technic.

METHODS OF TREATMENT OF UTERINE CARCINOMA

There are then, at present, the following methods of treatment for carcinoma of the uterus:

I. Surgery

II. Irradiation

1. Radium
2. X-ray
3. Radium plus x-ray.

III. Irradiation plus Surgery

1. Surgery and postoperative prophylactic irradiation
2. Preoperative irradiation followed by surgery
3. Preoperative irradiation followed by surgery and postoperative irradiation.

And yet what happens most frequently? The patient is operated upon without any type of irradiation; and then, at some future date, when a recurrence of the malignancy is found, the patient is sent for radiation therapy instead of at least using postoperative irradiation prophylactically. Even when surgery is properly followed by irradiation, the latter is all too frequently valueless because of inadequate technic.

Radiation therapy should always have a definite place in the plan of treatment for uterine carcinoma. It is unnecessary here to discuss the technic of the various operations or the various methods of irradiation, since they are both well established and well known. It would seem desirable, however, to discuss the combination of surgery and irradiation. I believe that where surgery and postoperative irradiation are used, it is well-nigh impossible to say which produces the better results; certain it is that there is a definite improvement in the results obtained when the surgical procedure is associated with radiation therapy. This fact can be definitely proved by statistics notwithstanding an occasional opinion to the contrary, and we must reiterate our previous statement, namely, that cases must be irradiated. Let us then consider prophylactic postoperative irradiation, for which there is available a large number of statistical studies. Kroenig and Gauss have, since the early days of irradiation, been able to markedly improve their statistics by the routine use of postoperative irradiation. Warnekros, by means of carefully planned and systematic use of postoperative irradiation of all operated cases, has been able to improve his figures of relative cures from 35.7 per cent to 71.8 per cent; in other words he has doubled the number of relative cures. It must naturally follow that his incidence of permanent cures must also be markedly increased.

This so-called "prophylactic" postoperative irradiation was the first method by which surgery and irradiation were combined. Kroenig and Gauss were pioneers in this work. Reports similar to that of Warnekros were made by Zacherl and Lundwahl in 1923, by Adler in 1924, Breitschneider in 1924, Giesecke in 1923, Lehotsky-Semmelweiss in 1926 and by many others. Carcinomas of other organs were also treated by postoperative irradiation. Seitz and Wintz, Eymer, v. Franque, v. Jaschke, Strassmann, Schaefer, Breitschneider, Flatau, Aubert and E. Zweifel have all shown that there is a definite value in postoperative irradiation for carcinomas of other organs and all stress the importance of proper technic and dosage.

It should be recalled that postoperative irradiation had previously been abandoned for carcinoma of the breast because of the fact that the early statistics showed a decrease in the percentage of cures. Surgery alone seemed to yield better results. H. Meyer now reports that he has been able to double the number of cures by the proper use of postoperative irradiation. Buchholz (*Strahlentherapie*, vol. 29) also reports a doubling of the number of cures by the proper use of postoperative irradiation. His report includes 358 cases treated between 1906 and 1924 and is of value because of the large number of cases studied. His results are practically the same as those of H. Meyer in Kiel and are strikingly similar to those reported by Warnekros for uterine carcinoma. Buchholz used average dosages as recommended by H. Meyer and by Sgalitzer of Vienna.

We must explain the action of prophylactic postoperative irradiation on the basis that probably the carcinoma rests or the carcinomatous glands are disturbed in growth and function by the removal of the primary tumor or that the connective tissue is stimulated in its struggle with the carcinomatous tissue and that the growth of the residual tumor tissue is thereby hindered.

PREOPERATIVE IRRADIATION

Another method of combining irradiation and surgery is accomplished by means of preoperative irradiation and it was soon observed that some inoperable cases were converted into operable ones by this procedure. It is of no consequence whether rapidly decreasing infiltrations were carcinomatous or inflammatory, the fact remained that they disappeared and the cases became operable. Such cases where surgery followed irradiation soon increased in numbers and this method of preoperative irradiation and surgery soon developed many advocates such as Schmieden, Wintz, Heyman, Burman, Pfahler, Donaldson, Ganti, Oppert and Regaud.

A. Mayer and Walthard first used this method systematically for carcinoma of the uterus. A. Mayer worked out the preoperative irradiation on the following basis:

1. Radium irradiation sterilizes the carcinoma. The discharge decreases and often stops. The streptococci which were previously found, disappear and as a result the primary operative mortality is markedly decreased.

2. Von Schmieden found that all carcinoma cells become definitely inactivated by irradiation. The danger, therefore, of spreading the carcinoma or of leaving a local carcinomatous residue behind is decreased.

3. The patients improve when bleeding and discharge stop and come to the operating table in much better physical condition after irradiation.

The clinical improvement, the sterilization of the carcinomatous mass, the epithelialization of the tumor mass and the cessation of bleeding are acknowledged by all authors and have led to the use of radium as the method of choice for the palliative treatment of all inoperable cases. Another argument for preoperative irradiation is found in the investigations of Dehler who reports from the Erlanger Frauenklinik that "a change in the virulence of the streptococci found in carcinomas following irradiation is a constant finding: five to seven weeks elapse before the infection disappears following x-ray therapy; for radium therapy a somewhat shorter time is necessary." This statement fits in well with the clinical observations of A. Mayer, who was able to decrease the primary mortality due to peritonitis from 10.9 per cent to 4.4 per cent. Fuerst and others have reported similar results.

PREOPERATIVE IRRADIATION, SURGERY, POSTOPERATIVE IRRADIATION

Stoeckel reported his new routine of systematic and carefully worked out course of therapy for carcinoma of the uterus at the Gynecological Congress in Bonn in 1927. This treatment begins with preoperative radium therapy and is followed by radical surgery and finally by postoperative x-ray therapy. He chooses the vaginal method of radical extirpation and has modified it in the following manner:

1. Deep bilateral paravaginal incisions are first made (after Staude).
2. The tissues involved in the paravaginal incisions and in the cuff incisions are carefully infiltrated with adrenalin.
3. The ureters are carefully demonstrated and dissected free.
4. The removal of the parametrium and paracolpos is carried out as the last step in the operation and after the four main arteries have been carefully ligated.
5. The operation is preceded by radium therapy and followed by x-ray therapy.

The combined method of irradiation, surgery, and irradiation is as yet too new a procedure to be accurately and finally judged. It would seem, however, to very definitely add to simple postoperative irradiation from a practical as well as theoretical standpoint. The definite decrease in primary mortality would in itself be sufficient reason for the carrying out of this method. It remains to be seen whether this method will decrease the number of recurrences; theoretically at least, this may be expected.

It has in the past been reasoned that preoperative irradiation increases markedly, by virtue of its sclerosing effect, the difficulties of

the actual surgical procedure; that not only is excessive scar tissue produced but that the tissues all become more brittle and that hemostasis is, therefore, more difficult. Mikulicz in his latest report, however, makes no mention of such results; Stoeckel, in 1927, even went so far as to say that the radical surgery following irradiation is easier than without preoperative irradiation. We can at least say that in the Berlin clinic no undesired effects followed preoperative irradiation.

THE RESULTS OF TREATMENT OF CARCINOMA

| | |
|---|--------------------------|
| I. Radical Operation by the Abdominal Route | |
| Relative Cures— | |
| Zweifel-Schweitzer | 48.5 per cent |
| Bumm-Franz | 40.0 per cent |
| Franz-Bracht | 44.9 per cent |
| Bauereisen | 61.9 per cent |
| Absolute Cures, Average | 20.0 per cent |
| II. Radical Operation by the Vaginal Route | |
| Relative Cures— | |
| Schauta | 38.0 per cent |
| Peham | 44.7 per cent |
| Stoeckel | 50.0 per cent |
| Absolute Cures, Average | 16-18 per cent |
| III. Irradiation Therapy | |
| Absolute Cures, Average | 17.7 per cent (Stoeckel) |

It will at once be apparent that no figures are quoted for relative cures by means of irradiation therapy. When one considers the variations in the definition of the term "operability," especially as to its frequency (Doederlein 15 per cent and Stoeckel 60 per cent), it must be evident that a comparison of relative cures through irradiation or surgery is no longer of any value. A comparison of the figures for absolute cures is not only possible but also of very definite value. Such a comparison shows surgery to be the more desirable method of therapy, the results by the abdominal route being 20 per cent, and by the vaginal route 17 per cent as against the results obtained by irradiation, 17 per cent. The difference is not, however, sufficient to rule out radiation therapy, especially when the factor of primary mortality is taken into consideration. Of all the published statistics on radiation therapy, only a very few can show better end-results than are obtained by radical abdominal surgery (Eymer 25 per cent, Heyman-Forsell 23 per cent, Kehrer 22.9 per cent and Ward 23.6 per cent). These results are approximately the same as the best published statistics for abdominal surgery.

ADVANTAGES OF IRRADIATION THERAPY

The great advantage which irradiation therapy possesses over radical surgery lies in the fact that with irradiation there is practically no primary mortality. Surgery has, on the other hand, a minimum pri-

mary mortality of from 5 to 10 per cent. This fact, well known as it is, has a far-reaching and diastrous effect in that it actually keeps patients away from the gynecologist. This unquestionably results in an increased mortality through delay. The laity, to a large extent, still believe cancer to be incurable. Such a conception must of course be changed and the public must be educated to the fact that not only is cancer curable but that the success of any type of therapy depends upon an early diagnosis.

In the treatment of inoperable carcinomas, irradiation therapy possesses marked advantages over any other type of treatment and even here, when all other methods have failed, it is possible to produce a certain percentage of absolute cures. This has been definitely proved by reports from Doederlein and others. Doederlein was able to produce absolute cures in 8 per cent of his inoperable cases, Heyman-Forsell in 13 per cent, and Regaud in 9 per cent and Wintz in 13 per cent.

All of the above discussion applies of course to carcinoma of the cervix uteri. Total vaginal extirpation cures a very large percentage of carcinomas of the corpus uteri, and the operation is a relatively safe one. The majority of gynecologists, therefore, use this method. For the inoperable cases, irradiation is, of course, indicated. Post-operative irradiation should, however, be used in every case as a prophylactic measure.

CONCLUSIONS

1. The methods of treatment for carcinoma of the cervix are:
 - a. Surgery
 - b. Irradiation
 - c. Surgery plus irradiation.
2. Radical total extirpation can be carried out either vaginally or abdominally.
3. Either method can be combined with irradiation.
4. Irradiation therapy may be produced by means of x-ray, radium or both.
5. The absolute percentage of cures by
 - a. Radical abdominal surgery is 20 per cent
 - b. Radical vaginal surgery is 17 per cent
 - c. Irradiation therapy only is 17.7 per cent.
6. Irradiation may be combined with surgery as preoperative, post-operative, or pre- and postoperative irradiation.
7. It is impossible, at present, to determine which procedure is the best.
8. The combination of irradiation and surgery produces better results than surgery alone.

9. Surgery should never, therefore, be performed without irradiation.

10. The greatest advantage which irradiation possesses is the fact that it is possible to cure a certain percentage of inoperable cases.

11. Irradiation has practically no primary mortality.

OBJECTIVES FOR THE FUTURE

The results obtained in the struggle against malignancy are, unfortunately, still very unsatisfactory; this is especially unfortunate in carcinoma of the cervix which can be diagnosed early and without much effort or skill. An improvement in the end-results of carcinoma of the cervix can be obtained by only a slight degree through an improvement in the technic. More marked results can be obtained by improving diagnostic methods. This is proved by the results of P. Zweifel who was able to report 87 per cent permanent cures in a series of carcinomas diagnosed early. Compared with these figures, an absolute cure of approximately 20 per cent is most unsatisfactory. If then women with early carcinomas can in the main be cured, it behooves us to educate women to apply for treatment early. Physicians as well as the laity must be educated and aroused to the necessity of early diagnosis and treatment. Women must be taught to present themselves for every irregular vaginal bleeding. Here lies the duty and function of the Committees on Cancer Control and Hygiene of the League of Nations. Funds must be donated and used for this purpose even as they are for the control of epidemics.

(For discussion, see p. 715.)

Dittel, L.: Psychotherapy in Gynecology. Wien. klin. Wchnschr. 42: 1478, 1929.

The author points out the psychic basis for many of the gynecologic complaints, laying special stress on those associated with coitus. In treatment of most of these complaints simple persuasion and suggestion are often sufficient. However, a knowledge of the various psychotherapeutic methods including analysis, Freud, Jung, Adler, hypnosis, etc., are highly desirable. The physician's personality, intuition, and assurance play an important rôle in obtaining results.

FRANK SPIELMAN.

REPORT OF RESULTS OF RADIUM TREATMENT OF CARCINOMA OF CERVIX

NINETY-TWO CASES TREATED FROM 1921 TO 1924, AT THE RHODE ISLAND
HOSPITAL

BY DR. HERMAN C. PITTS AND DR. GEORGE W. WATERMAN,
PROVIDENCE, R. I.

LATE in 1921 we received our supply of radium, and in the early months of 1923 the present clinic for the treatment of cancer, involving the female reproductive organs, was organized under the direction of the authors. The clinic met at first two afternoons each week throughout the year, for examination of patients referred for malignancy, or suspected malignancy, and for the reexamination of follow-up cases after treatment. All patients found to have malignant conditions were referred to the wards, and treated in the operating room under a general anesthetic, generally gas-oxygen. At the time of operation a biopsy was done on each case and the specimen sent to the pathologic laboratory, where it was examined by the pathologist and reported on. All of our cases, therefore, have a definite diagnosis based on microscopic examination of tissue removed. Unfortunately the slides up to 1925 have not been preserved, so that a review for the purpose of classifying as to the histologic grades of malignancy has not been possible in this series. For our later cases this will be possible, and we hope to report at some later time on this subject.

Our available radium for this series consisted of three 50 milligram tubes filtered by one-half millimeter of silver, and placed in a brass capsule 1 millimeter in thickness, and two 25 milligram tubes filtered in the same manner; also we had ten 5 milligram steel needles. The capsules were placed in the cervical canal usually two (2) 50 milligram tubes in tandem, contained in a piece of rubber tubing 4 millimeters thick. The remaining radium was placed against the cervix, being held in place by iodoform gauze packing. The steel needles were inserted about the periphery of the growth. Our plan at this time was to give between 3,500 and 5,000 mgh. of exposure, divided in two to three doses given at two to three weeks' intervals. We have since 1925 modified our treatment somewhat, and are now using, almost entirely, platinum filtered radium in the form of needles of 1 to 4 milligram content, which are thrust into the tissues about the cervix, placing them as near as possible to what we feel is the advancing edge of the growth. A platinum filtered capsule of 20 milligram content is placed in the

cervical canal. All the raidum is left in place six to seven days (144 to 168 hours). In this way we obtain a total of from 7,000 to 10,000 mgh. of gamma ray radiation, distributed in multiple small foci about and in the growth. We feel that our immediate results at least are much improved.

In our present reported series x-ray was not used except where we had to contend with extensive deep pelvic involvement. We have now begun to use deep x-ray routinely on all cases, and have recently been using it prior to radium, for a few selected cases where there was an extensive infected and necrotic growth.

For purposes of reviewing our cases we have drawn up three tables. Table I shows the number of cases seen each year, the number treated, and the number traced for a five-year period. The number alive at the

TABLE I

| YEAR | NO. CASES | NO. TREATED | NO. TRACED | ALIVE | | | | | CURES PER CENT | | | |
|-------|--------------|----------------|---------------|-------|-----|-----|-----|-----|----------------|--------|---------|--------|
| | | | | 1 | 2 | 3 | 4 | 5 | 3 YEARS | | 5 YEARS | |
| | | | | YR. | YR. | YR. | YR. | YR. | ABS | TRACED | ABS | TRACED |
| 1921 | 8 | 8 | 6 | 6 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1922 | 22 | 22 | 20 | 14 | 11 | 9 | 6 | 5 | 40.0 | 45.0 | 22.7 | 25.0 |
| 1923 | 32 | 31 | 32 | 10 | 8 | 6 | 5 | 5 | 18.7 | 18.7 | 15.6 | 15.6 |
| 1924 | 30 | 29 | 30 | 17 | 10 | 6 | 6 | 6 | 20.0 | 20.0 | 20.0 | 20.0 |
| Total | 92 | 90 | 88 | 48 | 31 | 21 | 17 | 16 | 22.8 | 23.6 | 17.4 | 18.2 |

Immediate mortality two cases, 2:90 or 2.2 per cent.

end of each year is then shown, and in the last two columns the three- and five-year cures in percentage figures. Two sets of figures are given, ABS, the absolute, calculated on the basis of all cases seen or examined; and Traced, based only on cases actually traced and known to be alive. Total figures for the four years are recorded at the foot of each column. It is evident that there is considerable difference between the three- and five-year figures. Many cases which were alive and, as far as clinical examination showed, free of disease at the three-year period, died later, generally from extensions starting in the deep pelvic lymphatics, which must have been present as small foci at the time of the original treatment. The problem of dealing with these pelvic glands is the most difficult one we have, and we freely confess it is as yet not solved. Deep x-ray has held, and will hold these involvements in check for a time, but does not cure, and eventually the disease wins out. We have in numerous instances opened the abdomen from above and planted needles or radon implants directly into the nodules, and in some instances apparently controlled the disease for a short interval. This method does not give permanent results, and there is certainly an added risk and mortality to be considered.

In Table II, the cases are tabulated as to age groups.

TABLE II

| AGE | CASES | TRACED | CLINICAL GROUP | | | | ALIVE | | | | | ABS | TRACED | OPER- |
|-------|-------|--------|----------------|----|-----|----|-------|-----|-----|-----|-----|----------|----------|----------|
| | | | I | II | III | IV | 1 | 2 | 3 | 4 | 5 | CURE | CURE | ABILITY |
| | | | | | | | YR. | YR. | YR. | YR. | YR. | PER CENT | PER CENT | PER CENT |
| 20-29 | 4 | 3 | 1 | 1 | 1 | 1 | 3 | 2 | 2 | 1 | 1 | 25.0 | 33.3 | 50.0 |
| 30-39 | 19 | 18 | 0 | 5 | 7 | 7 | 10 | 5 | 4 | 3 | 3 | 15.8 | 16.6 | 26.3 |
| 40-49 | 27 | 27 | 1 | 4 | 10 | 12 | 16 | 10 | 9 | 8 | 8 | 29.6 | 29.6 | 18.5 |
| 50-59 | 25 | 25 | 1 | 5 | 9 | 10 | 13 | 10 | 4 | 3 | 3 | 12.0 | 12.0 | 24.0 |
| 60-69 | 8 | 7 | 0 | 0 | 3 | 5 | 3 | 2 | 1 | 1 | 1 | 12.5 | 14.2 | 0 |
| 70-79 | 7 | 6 | 0 | 1 | 4 | 2 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 14.3 |
| 80- | 2 | 2 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| Total | 92 | 88 | 3 | 16 | 35 | 38 | 48 | 31 | 21 | 16 | 16 | 17.4 | 18.2 | 20.6 |

The age groups have been subdivided into clinical groups (defined in connection with next Table III), and in addition to the cure rates, the operability for each group is given, the operability per cent consisting of the ratio between Group I and II cases and the total. As might be expected the greatest number of cases fall in the fifth and sixth decades; in this series about an equal number in each. It is interesting to note that the percentage of five-year cures in the fifth decade group is quite markedly higher in spite of a lower operability rate, than either the preceding or succeeding decade. That the percentage of five-year cures should fall off rapidly in the seventh and eighth decades is to be expected, as the general life expectancy in these groups is of course much shorter. It would seem then that, in this series at least, patients between forty and fifty years old had the best prognosis for five-year cures.

TABLE III

| GROUP | NO. | TREATED | TRACED | LOST | ALIVE | | | | | ABS | TRACED COMBINED | |
|-------|-----|---------|--------|------|-------|-----|-----|-----|-----|----------|-----------------|----------------|
| | | | | | 1 | 2 | 3 | 4 | 5 | CURE | CURE | CURED PER CENT |
| | | | | | YR. | YR. | YR. | YR. | YR. | PER CENT | | |
| I | 3 | 3 | 3 | 0 | 3 | 3 | 3 | 3 | 3 | 100.0 | 100.0 | { 57.9 } 27.7 |
| II | 16 | 16 | 14 | 2 | 16 | 13 | 10 | 8 | 8 | 50.0 | 57.0 | |
| III | 35 | 35 | 34 | 2 | 18 | 10 | 7 | 5 | 4 | 11.4 | 11.7 | |
| IV | 38 | 36 | 37 | 0 | 11 | 5 | 1 | 1 | 1 | 2.5 | 2.5 | |
| Total | 92 | 90 | 88 | 4 | 48 | 31 | 21 | 17 | 16 | 17.4 | 18.2 | |

In Table III, the cases are divided into four clinical groups, based on the degree of clinical advancement of the disease. Of course, there is in this division a certain personal element, and there must always be a certain variation among operators as to what constitutes especially a Group II or Group III case. We classify as Group I, only cases in which the disease is definitely limited to less than one-half of one lip of the cervix. Group I cases are, therefore, relatively rare, 3.92; obviously this group should be most favorable because we can entirely surround it with radium, and completely cross-fire it. The three Group I cases are alive and well for the five-year period reported. Group II

cases are those where more than half of the cervix is involved, and where there may be a little superficial extension to the vaults, but where the uterus and cervix are still freely movable, that is, the cervix can be brought down with a tenaculum within normal limits. There is no fixation, and there is no thickening in the parametrial tissues, or evidence of involvement of the deep pelvic glands, as palpated per rectum. Not infrequently we find a fairly good sized cauliflower growth, which falls under this class. In our Group II cases our problem is more difficult, but yet we cured one-half of our cases for the five-year period.

Group III cases are those in which in addition to a more extensive cervical and vaginal involvement, there is definite fixation and thickening of the parametrium, with probable, but not always palpable, deep pelvic glands. Here we almost always obtain a good primary result. Cervix and vault heal over with disappearance of bleeding and discharge, and improvement in general health lasts from several months to five or six years. The outlook for a permanent cure is very doubtful, however, because we have no way of getting beyond the growth which is almost invariably present in the outlying glands, and as I have already stated, we do not know how to eradicate the cancer in these glands. We have only four out of 35 cases which have survived the five-year interval.

Group IV cases are those where the general involvement of the pelvic tissues is so great that only palliation is possible. Only 11 of this group survived the first year and five the second year. One case was followed for the five-year period, and when last seen by Dr. Pitts was alive and apparently free of disease. She has since been lost trace of. Whether she should have been classified as Group IV is a question. It sometimes is difficult to differentiate between an inflammatory reaction in the broad ligament and a true cancerous invasion. We certainly do not expect our Group IV cases to survive five years as the result of the methods of treatment now at our disposal. In the last column, the combined results for Groups I and II are shown to be 57.9 per cent; if we compute only on the basis of cases traced, 64 per cent. For Groups I, II, and III, that is, all but the hopelessly advanced cases, the cures amount to 27.7 per cent; and for the traced cases in these groups to 30 per cent. In this classification into four groups according to the clinical stage of the disease, we have followed more or less closely the classification laid down by Schmitz.³ We feel that the defined stages can be fairly accurately determined and that over a large series there will be the least amount of variation due to the personal factor. We prefer it to the less clearly defined "operable-borderline-advanced" classification.

In Table IV are shown the results obtained in several different clinics, in treatment of cancer of the cervix. The results from surgery are first given as determined by the excellent work of Heyman of the

TABLE IV

| CLINIC REPORTING | CASES REPORTED | 5 YR. CURES | OPERABLE | 5 YR. CURES | OPER- ABILITY |
|--|-------------------|----------------|----------|----------------|------------------|
| | | PER CENT | | PER CENT | PER CENT |
| Operative Statistics ¹ | 5806 | 19.1 | 3659 | 35.6 | 54.6 |
| Radiologic Statistics | | | | | |
| Radium Hemmet 1914-1923 ¹ | 790 | 20.6 | 180 | 40.4 | 25.5 |
| 17 Clinics Combined, Heyman ¹ | 3512 | 16.3 | 960 | 34.9 | 25.6 |
| Woman's Hospital, G.G. Ward ² | 134 | 23.1 | 32 | 53.5 | 23.8 |
| Mayo Clinic, Bowing-Fricke ⁵ | 1094 | 21.8 | 9 | 66.6 | 0.8 |
| Schmitz-Hueper ³ | 332 | 17.5 | 71 | 53.5 | 21.9 |
| Rhode Island Hospital | 92 | 17.4 | 19 | 57.9 | 20.6 |

Radium Hemmet who collected his statistics from twenty operative clinics.

While our number of cases is perhaps small in comparison to others, we feel that our results are creditable, and hope that our next figures may show some improvement.

In conclusion we must join the ranks of others, and draw the lesson that at present our best chance in treating cancer of the cervix successfully lies in the early recognition of the disease. When we get the cases still in the Group I and II stage, our results are very good, and the prognosis is very favorable; we can approach our problem with justified confidence. When the patient comes late or with definite fixation, we must be extremely guarded in our prognosis of more than a temporary betterment of the condition.

In regard to the reporting of series of cases, we feel as others do, that there should be some uniform method of classifying cases, and reporting of results, whereby the figures of different clinics could be compared. Where one clinic reports 25.6 per cent operable cases, and another only 0.8 per cent it is quite obvious that different standards are in force. We believe that advancement in method of treatment can come only through further clinical experimentation; that each clinic should develop its own ideas and technic, but that all should conform to a like standard in describing and reporting results. In this way only, progress can be made.

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68 BROWN STREET.

THE ROENTGEN RAY AS AN ADJUNCT IN OBSTETRIC DIAGNOSIS*

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THIS study was undertaken with the object of reviewing and evaluating the use of the roentgen ray in obstetrics in general and more particularly in abnormal conditions during pregnancy. A great deal of excellent work has been done in this field yet I believe that radiography is insufficiently employed in obstetric and gynecologic diagnosis. To contribute our experiences and results and to stimulate those of you who teach and practice obstetrics to make more use of this very important adjunct is my only excuse for presenting "just another paper" on this subject.

That the science of roentgenology enters into and cannot be dissociated from the practice of internal medicine and surgery is a universally accepted fact. That it should be the same in the practice of obstetrics and gynecology is conceded but not generally practiced. The difficulty, up to now, undoubtedly has been due largely to inadequate equipment, fear of injury to the fetus and general ignorance of the value of roentgenology in obstetrics. However, the time is not far distant, if indeed, it is not now upon us, when roentgenology and obstetrics and gynecology must be more intimately associated. This can and will be done provided the roentgenologist and obstetrician work together harmoniously. This will not be difficult for the roentgenologist is always, both by instinct and training, cooperative and consequently there should be no difficulty in developing the proper "teamwork." The obstetrician must take the lead and exhibit the proper amount of enthusiasm, for certainly the roentgenologist cannot be expected to know when roentgenography is indicated in a given obstetric case. It would seem therefore that the future of this very important help in better diagnosis is entirely in the hands of the obstetrician. Do not misunderstand and think for a moment that the x-ray can or should supplant any of our methods of obstetric diagnosis. It should be looked upon only as an adjunct.

In view of our present-day knowledge, the roentgenologist and the obstetrician who understand their problems may proceed without fear of doing harm to the fetus, regardless of the stage of its development. Meticulous care in the exposure at any one sitting is most important. It has been estimated that the usual amount of radiation involved in

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the making of a film of the pregnant uterus is equal to $\frac{1}{50}$ of an erythema dose. (Hickey.) Another method of estimating a safe amount of exposure has been figured out for me by Dr. A. L. L. Bell, Radiologist at the Long Island College Hospital and is as follows: with 88 K.V., 30 M. A. and 1 mm. aluminum filter it takes only 23.5 seconds to give the same depth dosage as is obtained with 118 K.V., 3 M. A., and 3 mm. aluminum filter in 2 minutes. We know that the standard for maximum exposure is that amount of radiation which will produce biologic effects. It is also known that 25 radio units (international) will produce such changes in the ovary of the adult. A 23.5 seconds exposure, using 5 inch gap, 30 M. A. and 1 mm. aluminum filter at 10 inch skin distance results in a depth dose of 25 radio units, therefore to be reasonably certain that no biologic effects are produced on the fetus in utero this "dose" should be cut at least in half and preferably more. This means that on the basis of one-half of this "dose" and assuming a 3 second exposure, only three or four films at one sitting could be safely made. Furthermore the effects of x-radiation on tissue in general is exhausted in about three weeks and hence we feel safe in exposing the fetus in utero several times during a given pregnancy, provided the time is properly spaced. With this evidence at hand it at once becomes apparent that such "dosage" is absolutely safe as far as danger to the fetus is concerned. Several investigators, including Warnekros of Dresden, have taken numerous consecutive roentgenograms (18 exposures) of the mechanism of labor, more particularly during the actual delivery, and have noted no ill effects upon the child. I cannot think of a single instance where more than 4 to 6 roentgenograms need be taken during a given pregnancy and certainly this number is within safe limits.

We have taken roentgenograms of 306 pregnant women, a few of which have been radiographed from 4 to 6 times, the average being 2, totaling over 600 films, and we have not seen any abnormalities in the children attributable to the x-rays. Many of the children have been followed up for five years in the pediatric clinic at the Long Island College Hospital and the Methodist Episcopal Hospital and in private practice. Those skeptics who are continually crying out against the diagnostic use of the x-ray in obstetrics should remember these facts. Furthermore, they should remember that all of the proved cases of fetal malformations attributable to irradiation have been in those cases treated with therapeutic doses of x-ray or radium for certain pathologic lesions (uterine bleeding, fibroids, cancer, etc.) and naturally such cases should not be confounded with the type under consideration. We feel sure that no pregnancy, regardless of its stage of development, is damaged by diagnostic roentgenology properly carried out.

Professor Roentgen discovered the x-ray in 1895. In reviewing the literature since that time one finds that the roentgen rays, although rather sporadically, have been used as an adjunct in obstetric diagnosis. Why such a valuable addition to our diagnostic armamentarium has not been more universally used by the obstetrician, as it has been by the surgeon and internist, is difficult to explain. It may be said, however, that obstetrics, during the past twenty-five years, has not made the same outstanding and far-reaching advances as an art that medicine and surgery have. Furthermore, be it remembered that, twenty-five years ago and even today in certain communities throughout our country, almost any person may practice "so-called obstetrics"; whereas to practice surgery one must have had some special training, or at least served an apprenticeship under a qualified surgeon, before "going out on his own." When the public demands this of their obstetricians then the science and the art of obstetrics will have the recognition it well deserves. When this "comes to pass," and it will in a few more years, obstetric diagnosis will be placed on a higher plane and hence every available adjunct will be used for arriving at a proper diagnosis. We shall be doing pelvimetry and cephalometry after the method of Thoms or some modification of this method; diagnosing doubtful pregnancy; and finally when there is the slightest doubt regarding multiple pregnancy, the possible existence of fetal abnormality, faulty or doubtful presentation and position, death of the fetus or pseudocyesis, we shall make a positive diagnosis by means of the roentgen ray. The surgeon has made the x-ray an integral part of his diagnostic equipment and could not possibly continue his work without it. Today a surgeon could not expect to win a suit for malpractice, for example, if he had not employed the x-ray in making a correct diagnosis and carrying out the proper treatment. Tomorrow the obstetrician is likely to find himself in much the same position.

While the work to be presented in this paper does not include pelvimetry and fetal cephalometry, I think it most important and regret that we have been unable to do much with this phase of the subject. We expect to make a report, however, on this work some time in the future. The pelvic inlet can be measured by the x-ray, although up to now the methods in vogue have been so complicated that the average roentgenologist could not, or for the lack of time and proper cooperation, would not assist the obstetrician in carrying out the scheme. At present, however, with the less complicated method of Thoms, this procedure can be carried out without undue labor and loss of time. Furthermore, Thoms' method of measuring the important diameters of the fetal head in utero seems far more simple and practical than any other method heretofore proposed and bids fair to become of inestimable value to the obstetrician. Neither of these meth-

ods need be carried out routinely but in certain doubtful cases much of the guesswork of former years can be eliminated by the use of them singly or in combination.

For the past five years we have been using the roentgen ray in all our obstetric cases where there was any doubt as to the correct diagnosis. In the beginning our technic was faulty and hence we failed many times in obtaining a readable skiagram of the fetus in utero or perhaps of a given maternal pelvic deformity. Persistence, on the part of both the roentgenologist and the obstetrician, developed a better technic and hence a better photographic plate. It is only by such "team work" that this kind of diagnostic work can be carried on with success. Our endeavors have been limited to the diagnosis of the various uncertain conditions associated with the pregnant state.

The conditions in obstetrics for which the x-ray may be used as an adjunct in diagnosis are the following:

Group I.—Those relating to the maternal pelvis: (1) deformed pelvis (all varieties); (2) pelvis measurements, especially the superior strait; (3) bony or calcified tumors of or in the pelvis; (4) separation of the pubic symphysis; (5) amount of healing after pubiotomy.

Group II.—Those relating to extrauterine pregnancy: (1) tubal pregnancy; (2) abdominal pregnancy.

Group III.—Those relating to intrauterine pregnancy: (1) diagnosis of pregnancy before other characteristic signs and symptoms appear—pneumoperitoneum method of Peterson—not so important now as we have the Zondek-Aschheim test which is positive in 98 per cent of the cases; (2) early diagnosis of pregnancy from the fourteenth to the twentieth week when for one reason or another a positive diagnosis cannot be made; (3) multiple pregnancy—twins, triplets, etc.; (4) presentation and position of fetus; (5) cephalometry; (6) death of the fetus; (7) monsters, anencephalus, hydrocephalus, double monsters, etc.; (8) spina bifida and other defects in the fetal skeleton; (9) syphilis of fetal bones; (10) hydatidiform mole (by exclusion); (11) fractures of the fetal bones and skull; (12) osteogenesis imperfecta; (13) illegitimate pregnancies where no examination can be made; (14) for the diagnosis of pregnancy, presentation, and position in very large fat women, 200 to 300 pounds; (15) before cesarean section to determine if the child is normally formed.

Group IV.—Those relating to pelvic tumors simulating pregnancy: (1) fibroid tumors of the uterus and pregnancy at or beyond the sixteenth week; (2) myomata uteri simulating pregnancy; (3) ovarian cysts, particularly dermoids.

Group V.—Miscellaneous conditions: (1) spontaneous version; (2) pseudocyesis; (3) mechanism of labor; (4) mode and method of separation of placenta (Warnekros); (5) lithopedian; (6) location of placenta; (7) proof of extrauterine life (Vogt).

Of the conditions enumerated in the preceding paragraphs, those in which we actually used the x-ray to complete or make more positive the diagnosis were the following: (1) early pregnancy fourteen to twenty weeks; (2) multiple pregnancy; (3) presentation and position; (4) hydatidiform mole (made by exclusion); (5) monsters especially anen-

cephalus; (6) fetal death; (7) spina bifida (cervical); (8) pregnancy, presentation, and position and abnormalities in very large fat women (one over 260 pounds); (9) previous to cesarean section to determine if the child is normal; (10) fibroids complicating possible pregnancy; (11) ovarian cysts mistaken for pregnancy; (12) abdominal pregnancy; (13) deformed pelvis, without pelvimetry. In every one of these conditions there was some doubt about the correctness of the diagnosis as made by the usual methods in such cases (viz.: history, physical examination, laboratory data and clinical course). This seems



Fig. 1.—Mrs. F., No. 235. X-ray taken to ascertain type of deformity of pelvis. Obliquity due to ankylosis of left hip and adduction of thigh. Left oblique less than right oblique. Also shows early pregnancy of about fifteen weeks, which can be distinctly seen on the original x-ray plate at points indicated by arrows.

to me to be well worth while and highly desirable in any obstetric clinic, private or public.

The main factors which mitigate against positive roentgenograms, especially during the early months of pregnancy, are the thickness of the mother's abdominal and uterine walls; respiratory movements of the mother; the liquor amnii, which is radio-opaque; insufficient density of embryonic bones; later in pregnancy, the circulating blood in the uterus and placenta, which Bartholomew (1921) estimated absorbs about 60 per cent of the rays; and finally movements of the fetus

which blur or duplicate the film and thereby cast some doubt as to the true diagnosis. Because of the presence of these conditions the roentgenologist who wishes to succeed must devote considerable time and meticulous care in taking each film. Such work cannot be delegated to a technician unless well trained in the filming of the abdomen and pelvis during pregnancy. The Potter-Bucky diaphragm is of course absolutely essential and the best superspeed films obtainable are very important adjuncts in securing good roentgenograms.

TECHNIC¹

Posturing (arranging the patient in the best position) is very essential although not as difficult as other items in technic because it is more controllable. Motion, such as respiration of the mother, is often difficult to control but patience brings its reward. We always take two films, one anteroposterior and one lateral exposure, because diagnostic phases not included in one position will usually be noted in the other and therefore a more correct opinion may be rendered. The following table gives the technic in detail:

All exposures to be taken on Bucky diaphragm.

Tube, 30 M. A., radiator type.

Film, duplitized safety contrast films, used with double screen (Eastman).

Anteroposterior and lateral exposures.

Measurements taken through the greatest diameter of the abdomen and expressed in inches. Lateral exposures are measured separately, and machine setting changed accordingly.

Gap is measured by the point gap method and read in inches.

Time factor is variable, particularly in the higher measurements.

Dark room technic, standard.

| Size | Gap | M. A. | Time |
|------|-----|-------|--------|
| 6" | 3 " | 30 | 4 sec. |
| 7" | 3½" | 30 | 4 " |
| 8" | 4 " | 30 | 4 " |
| 9" | 4½" | 30 | 6 " |
| 10" | 5 " | 30 | 8 " |
| 12" | 5 " | 30 | 12 " |
| 14" | 5 " | 30 | 12 " |

In the diagnosis of early pregnancy (fourteen to twenty weeks), before the usual signs and symptoms permit of a positive diagnosis, the x-ray is of inestimable value. By its use we were able to make a positive diagnosis from fourteen to fifteen weeks in 15 per cent of our questionable cases, from sixteen to eighteen weeks in 75 per cent and from the eighteenth week to term in 100 per cent.

For example, a widow, forty-four years old with amenorrhea of six months' duration and who had had a diagnosis of a large soft fibroid tumor of the uterus, consulted Dr. G. H. Davis, a member of our staff, who thought she was pregnant, although the fetal heart could not be heard and no fetal movements had been felt by the patient. Since the woman had been a widow for eleven years she became highly indignant at the diagnosis of probable pregnancy, vehemently denying exposure. A roentgenogram revealed fetal bones indicating early pregnancy of about fourteen

¹Outline of technic contributed by Dr. Geo. W. Cramp, Roentgenologist of the Methodist Episcopal Hospital of Brooklyn.

of fifteen weeks' duration. The woman then admitted exposure three and one-half months previous to the date of her visit to the doctor's office. Some weeks later she reported to her physician that she had had an abortion performed and was "well and happy."

Again a young primipara (Fig. 1) who had an ankylosed left hip resulting from an old suppurating condition, the nature of which she did not know, consulted her physician because she thought herself pregnant. According to the date of her marriage and last menstrual period she should not have been more than fourteen weeks pregnant. Upon examination she was found to be about three and one-half months



Fig. 2.—No. 3796, Mrs. T. Suspected twins, only one fetal heart heard. Roentgenogram in lateral position required to show twins.

pregnant. The question of her delivery then came up for consideration. A skiagraph was taken of the pelvis and fortunately we obtained the desired information regarding the bony pelvis, fetal bones, proving the positive existence of early pregnancy.

These two cases are the earliest films of a fetal skeleton that we have obtained, the pregnancy being not more than fourteen to fifteen weeks' duration, and unless we can improve our present-day equipment and technic, I do not believe it is possible to obtain a readable

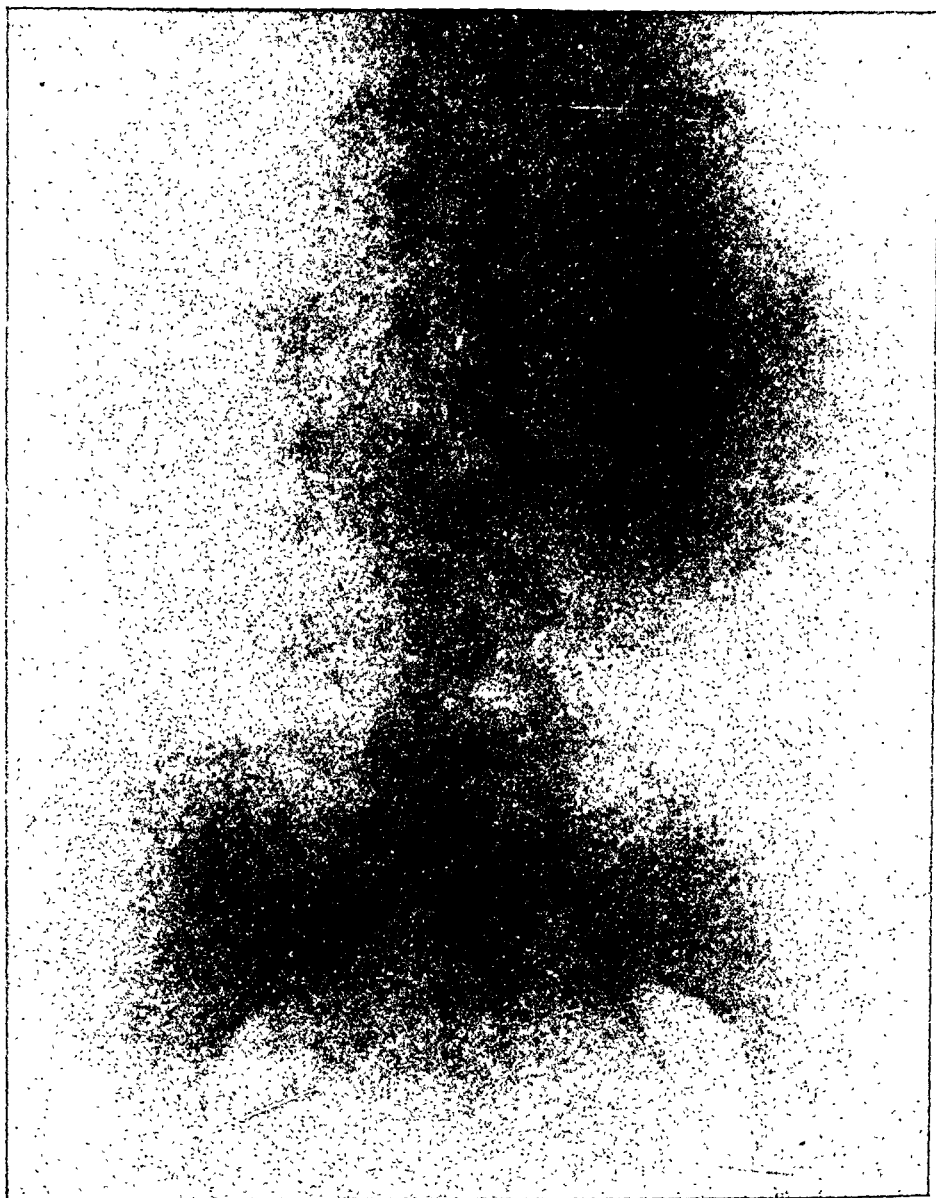
skiagram earlier than fourteen weeks and only a small percentage at this age. We took 18 roentgenograms of early pregnancy cases from the prenatal clinic at the Methodist Episcopal Hospital and private cases from eight to fourteen weeks, and in only 3 did we get a readable skiagram and these were from fourteen to fifteen weeks' duration.



Fig. 3.—Mrs. G. B., x-ray diagnosis of triplets at seven months; delivered at eight and one-half months, all born alive.

In all other conditions associated with the pregnant state in which we employed the roentgen ray as an aid in diagnosis we found it most informative, either positively or negatively. It was probably employed more times for the diagnosis of multiple pregnancy than for any other condition (Figs. 2, 3, 4, and 5). For this it was always positive, since the question of multiple pregnancy does not usually come up for final decision until rather late in the pregnancy. In the

diagnosis of presentation and position one does not need the x-ray very often. Still we used it a number of times for the positive diagnosis of breech and occiput posterior positions particularly in very large fat women. Recently we used the x-ray to make a positive diag-



Figs. 4 and 5.—Mrs. M. G., No. 299. Twin pregnancy, showing value of routine anteroposterior and lateral exposures. Anterior film (Fig. 4) shows merely a head in the pelvis but the lateral film (Fig. 5) shows the other head in the upper abdomen.

nosis of pregnancy as against hydatidiform mole in the following case: a young duo-para was thought to have an hydatidiform mole. She gave a history of pregnancy of about five months' duration and many of the characteristic signs of vesicular mole were present, in-

cluding a vaginal discharge which had persisted for two months (dark and bloody, and sometimes bloody serous) but more recently there had been little if any discharge. There was no doubt about the diagnosis

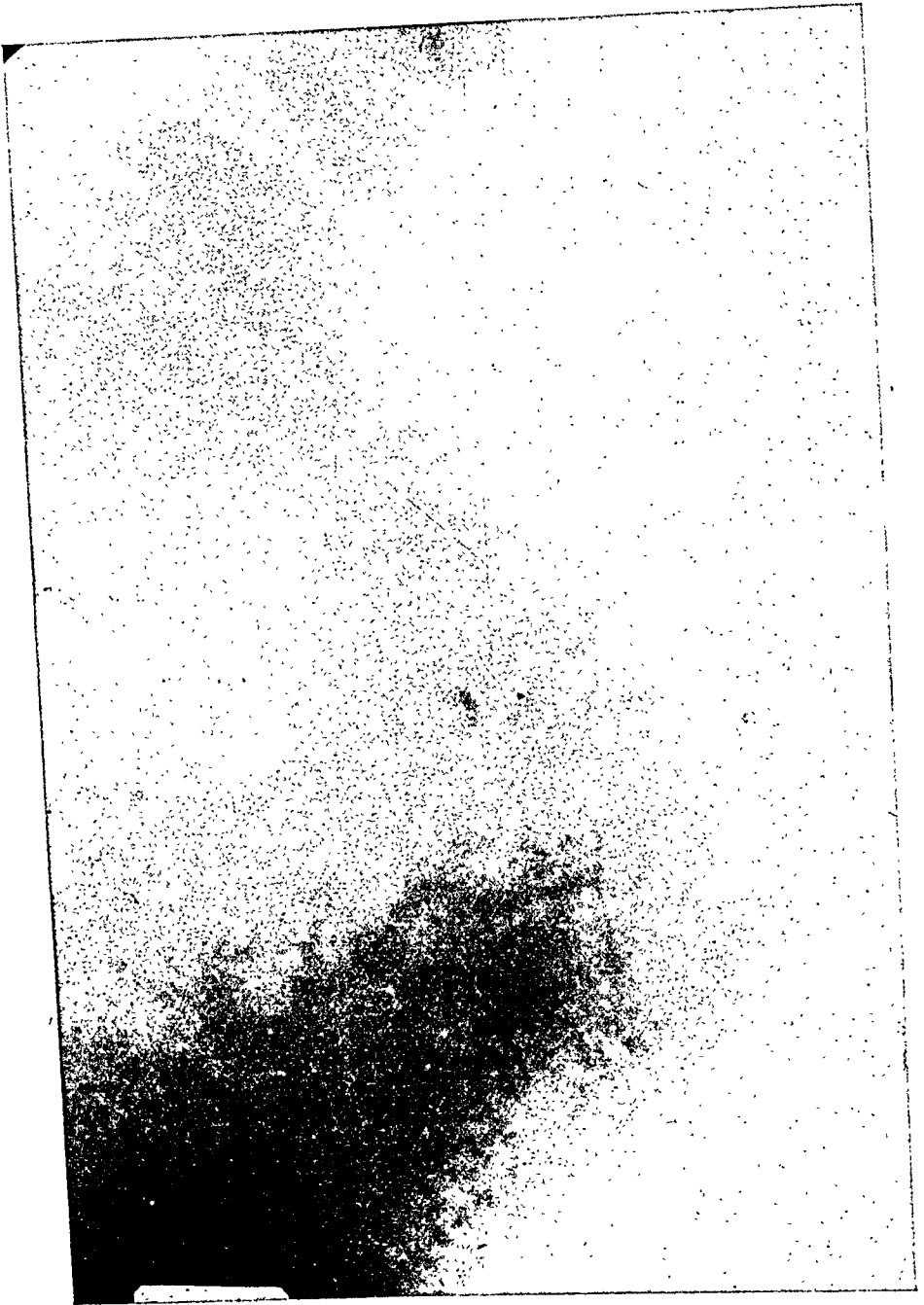


Fig. 5.

when the skiagram showed a fetal skeleton with positive signs of fetal death. Labor was induced and she was delivered of a dead fetus followed by a large amount of bloody liquor amnii and clots, which

undoubtedly accounted for the uterus measuring seven months in height while the history and roentgenograms indicated only about five months' pregnancy.

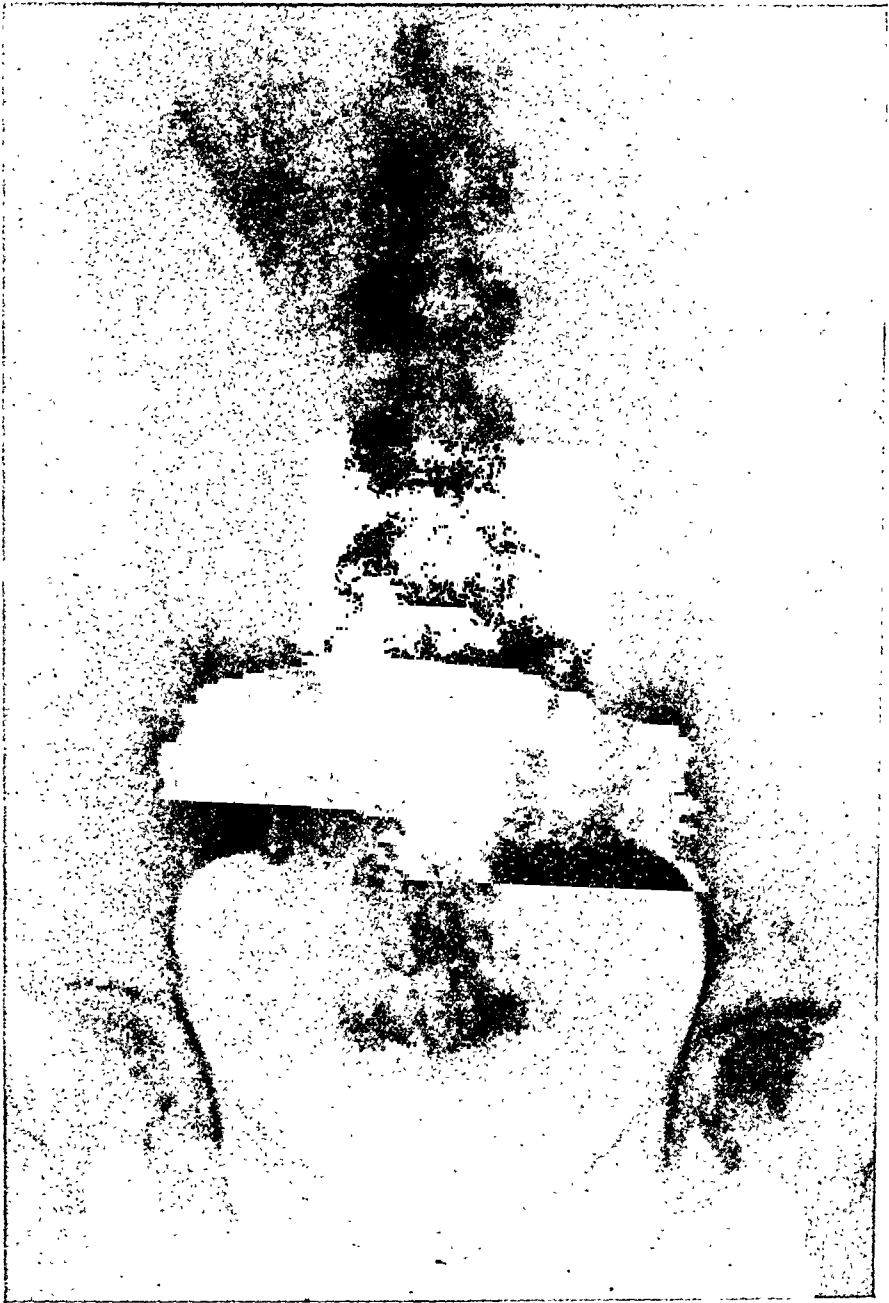


Fig. 6.—Mrs. A. K., No. 218, Anencephalic monster, full term. Moderate polyhydramnios. Note outline of the feet.

In our series the diagnosis of anencephalic monster was made five times before delivery was accomplished, thereby enabling the obstetrician to fortify himself against criticism by informing the family

(never the patient!) of the presence of a fetal monster. (Fig. 6.) I have personal knowledge of a case of hydrocephalus of such marked degree that the upper abdomen was markedly distended whereas the presenting breech did not unduly distend the lower abdomen. While



Fig. 7.—(A. P.), Mrs. P., No. 50343. Clinical diagnosis of fibroids, operation advised by surgeon. X-ray showed a complicating pregnancy about sixteen weeks duration. Delivered of normal child, 8 pounds. Aug. 20, 1923.

the obstetrician might not have suspected hydrocephalus, he should have suspected that some abnormality of the fetus was likely. At any rate, without a roentgenogram, cesarean section was done and a huge hydrocephalic monster was removed which fortunately died in a few days. Another instance where the x-ray would have saved the obstetri-

cian much criticism is illustrated by the following: a young, wealthy society woman, pregnant for the first time, at full term, had been in labor some twelve to fourteen hours without satisfactory progress.



Fig. 8.—Lateral view of Fig. 7. Arrow points to fetal femur.

After a careful vaginal examination and a final survey of the case it was decided to perform cesarean section. This was done and an anencephalic monster was delivered which died in a few minutes. There was considerable consternation and criticism from the family.

A skiagram before the operation would have made a correct diagnosis, the family could have been informed of the true state of affairs before the delivery and cesarean section need not have been performed. The mother was very ill following the operation but finally fully recovered.

Today the surgeon or gynecologist who removes a fibroid uterus that contains a four or five months' pregnancy may well feel chagrined and indeed not be surprised if suit is instituted against him for malpractice. The Zondek-Aschheim test will give positive information in 95 per cent of the early pregnancies while if the pregnancy is be-



Fig. 9.—Mrs. M. S., No. 69027. Question of pregnancy associated with fibroids of uterus. A calcified fibroid. Roentgenogram also revealed early pregnancy (sixteen to eighteen weeks).

tween the sixteenth to eighteenth week the x-ray will give positive evidence in 85 per cent and beyond the eighteenth week 100 per cent of the cases. In our series we made a positive diagnosis of pregnancy in the presence of fibroid five times (all fifteen to eighteen weeks) and eliminated pregnancy in one where the fibroid tumor was somewhat softened and nodular and about the size of a five months' pregnancy. From the history we did not feel that the patient was pregnant, but from the pelvic examination there was a suspicion of pregnancy due to the softness and compressibility of the uterine mass. A skiagram was taken and reported negative for pregnancy.

This case came to hysterectomy and the ablated uterus did not contain a fetus. Now while I am fully aware of the fact that we might have missed the presence of fetal bones by the roentgenogram in this case, nevertheless a negative roentgenogram added considerable more evidence to the fact that pregnancy did not exist. An instance where the x-ray saved a pregnancy that was very much desired is illustrated by the following case: a thirty year old nulliparous woman, who had been married five years and was anxious to have a child, consulted a well-known surgeon because of an amenorrhea of four months' duration and gradual enlargement of the abdomen. The surgeon diagnosed



Fig. 10.—A. S., No. 77439. Question of ovarian cyst or thin-walled pregnant uterus. Roentgenogram demonstrated presence of pregnancy. (Sixteen weeks.)

fibroids and recommended operation. The patient refused this advice and went to another better known surgeon who recommended the same operation that the first surgeon had offered and again she refused. She thought she might possibly be pregnant and since she was very desirous of a child, she again consulted her faithful and sympathetic family physician who referred the case to us. Examination revealed a nodular fibroid uterus, rather soft in spots, and about the size of a five or six months' pregnancy. No fetal heart could be heard and no life had been felt by the mother. A roentgenogram revealed an early pregnancy and she was delivered Aug. 20, 1928, which made her not

more than sixteen weeks' pregnant at the time the roentgenograms (6 in number) were taken. (Figs. 7, 8.) The child is alive and well today and needless to say the family is highly elated. She has not yet been operated upon for her fibroids. This one case should "sell" the x-ray to every obstetrician and gynecologist. (Fig. 9.)

Another most interesting case in which the x-ray cleared up an uncertain diagnosis was the following: a young woman twenty-five



Fig. 11.—Mrs. M. B., No. 5164 Eight and one-half months pregnant. Examined in prenatal clinic May 9, 1930. Fetal heart O. K. Fetal movement present. Admitted to Methodist Episcopal Hospital May 12, 1930, fetal heart not heard, no fetal movements for two days. Roentgenogram showed distinct overlapping of skull bones and bowing of spine. Stillbirth two days later. Diagnosis of fetal death made by the roentgenologist between forty-eight and seventy-two hours after fetus died. Earliest case in our records.

years old, a "cub" reporter on the staff of a large New York newspaper, was referred to me with a diagnosis of ovarian cyst, for operation. Upon examination I found what I thought was a very thin walled pregnant uterus but no fetal heart could be heard. The pregnant uterus felt very much like an ovarian cyst. However, I informed

the young lady that she was pregnant. She had previously been rather evasive in her history and now became quite abusive because of the diagnosis of pregnancy. To allay the young lady's anger and to fortify myself against possible error, I advised her to go immediately for an x-ray. A roentgenogram showed the fetal bones of an early pregnancy (about sixteen weeks). (Fig. 10.) Faced with positive evidence of pregnancy, she promptly admitted having been exposed.



Fig. 12.—Mrs. F. Abdominal pregnancy. Fetus high up under ribs on right side. A long bone just below right iliac crest with faint outline of small uterus in right side of pelvis, sufficiently strong to suspect abdominal pregnancy with history and physical findings. Positive diagnosis was made from the film. Operation and delivery of a live child.

There is no method by which the death of the fetus in utero can be positively and quickly determined except by the roentgen ray. For this reason we became much interested in the x-ray diagnosis of fetal death because there are many times, particularly in consultation practice, where this positive information is highly desirable both by the patient and the physician. The never-failing skiagram characteristics

of dead fetus in utero are: (1) overlapping of the cranial bones (Spaulding's sign); (2) asymmetry of the fetal head with wrinkling of the scalp, which cannot always be seen on the film but if seen is



Fig. 13.—Mrs. R. B., No. 1098. Breech presentation. Head high, giving distortion in anteroposterior position; might be mistaken for hydrocephalus unless lateral view is taken. Child normal at birth.

corroborative evidence of fetal death; (3) collapsed appearance of the "thoracic cage"; (4) angulation or bowing of the vertebral column ("horse-shoe spine"). Practically every roentgenogram of intra-

uterine fetal death gives the first two signs enumerated above within a few days and if the child has been dead two weeks or longer all four signs are invariably present. We have had occasion to x-ray 17 cases of suspected intrauterine death, in cases where no fetal motion had been felt by the mother for several days or weeks and no fetal heart heard by the physician. All of these cases proved to be dead on deliv-

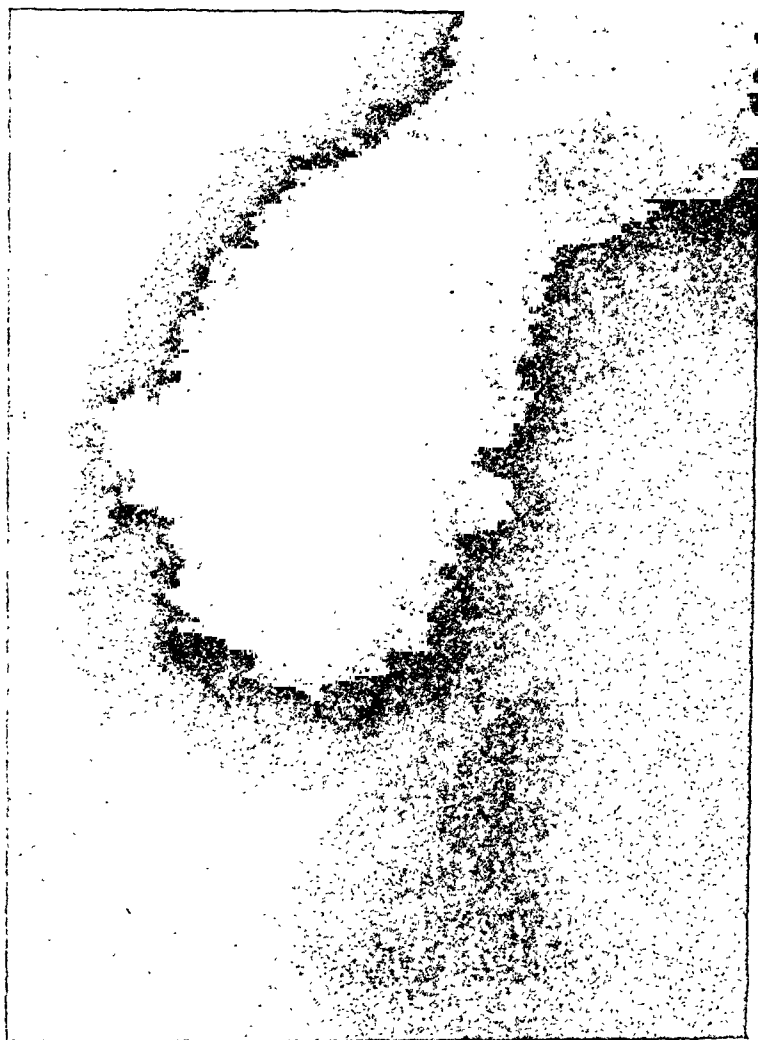


Fig. 14.—Mrs. B. S., No. 4061. Question of twins, large abdomen only one fetal heart heard. Roentgenogram revealed one child. Fetus moved, giving the impression of two heads. Demonstrates need of meticulous care in reading films.

ery. Spaulding's sign is pathognomonic and appears very soon after the death of the fetus, in one of our cases between two and three days. The mother had felt no fetal movements, the obstetrician could hear no fetal heart sounds, and the x-ray revealed overlapping of skull bones. Naturally Spaulding's sign would be of no value in a case in labor with the head engaged. The other signs, which follow Spaul-

ding's sign fairly rapidly (ten to fourteen days), are just as characteristic of fetal death, but as they appear later, it seems fair to say that overlapping of the skull bones is the earliest sure sign of fetal death. I might add before leaving this subject, that the fourth sign of fetal death in utero ("horse-shoe spine" or bowing of the vertebral column) is one that I have not seen mentioned in the literature but one which we have found to be constantly present after ten to fifteen days and of very positive diagnostic value. (Fig. 11.)

The incidence of cesarean section is obviously on the increase and while the morbidity and mortality is considerably less than it was ten years ago there is still room for improvement in certain communities. It is good obstetrics to perform cesarean section when indicated and if the baby is alive and normal there is no operation more satisfactory. Notwithstanding the importance of the child, many of the most careful obstetricians do not use the roentgen ray before cesarean section to determine whether or not the child is normal. This point I wish to emphasize, viz., every candidate for cesarean section should have a roentgenogram before operation. While we have not, for obvious reasons, routinely practiced this in our clinics, we do have a roentgenogram of every case that shows the slightest deviation from the normal and as many others as is consistent with good judgment.

In the very large obese women, with thick pendulous abdomen, the x-ray offers positive evidence of pregnancy, oftentimes before the obstetrician can make a diagnosis by the usual methods. Furthermore, the diagnosis of suspected abdominal pregnancy, as illustrated by Fig. 12, can be positively made by a good skiagram of the abdomen.

Regarding the abnormal pelvis, considerable information can be obtained if one has had sufficient experience, by the use of the roentgenogram. There are, of course, many chances for error and since the Thoms' method of pelvimetry is exact and practical it would seem that this method should displace the less accurate one of "comparative measurements with the eye." (Figs. 13 and 14.)

CONCLUSIONS

1. A positive roentgenogram of the fetal skeleton is proof of the existence of pregnancy. This may be added as a fourth positive sign of pregnancy and may be obtained as early as the fourteenth to fifteenth week in 15 per cent of cases, at sixteen to eighteen weeks in 75 per cent and beyond the eighteenth week 100 per cent of the cases.

2. A positive diagnosis of normal and abnormal pregnancy, including many types of fetal abnormalities, can be made by the roentgen ray, provided the pregnancy is at or beyond the eighteenth week. The farther advanced the pregnancy the more positive the diagnosis.

3. A positive diagnosis of fetal death can be made by roentgen ray, apparently within three or four days after death, provided the pregnancy is at or beyond the sixteenth week.

4. A positive diagnosis of pregnancy complicating fibroids of the uterus can be made by the roentgen ray, provided the duration of the pregnancy is sixteen weeks or more.

5. A positive differential diagnosis between pregnancy and other pelvic tumors (soft myoma, ovarian cysts, etc.) can be made by the roentgen ray, provided the pregnancy is at or beyond the sixteenth week.

6. The filming "dosage" herein recommended is perfectly safe for the fetus.

7. Every patient who is a candidate for cesarean section should have a roentgenogram taken to determine the normalcy of the child.

8. A positive roentgenogram may be offered in court cases as proof that pregnancy exists.

9. Finally, it is highly desirable that the obstetrician cooperate with the roentgenologist and thereby help to further develop, simplify and popularize a very important adjunct in obstetric diagnosis.

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DYSMENORRHEA OF ENDOCRINE ORIGIN RESPONDING SATISFACTORILY TO MEDICAL THERAPEUTIC MEASURES

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THE lack of knowledge concerning the pathologic physiology of the functional dysmenorrheas and the lack of sufficient therapeutic measures at our command make their treatment indeed a perplexing problem.

This essay is prompted by both the failure of most writers to mention a type of functional dysmenorrhea responding satisfactorily to medical therapeutic measures and the desire to increase the armamentarium of the physician to recognize and treat this dysmenorrhea in that it often frequents his practice unrecognized. It is symptomatic of a more or less constant clinico-pathologic entity, "interstitial thyrotoxicosis" which is a pluriglandular affection associated with secondary thyroid manifestations and when the thyroid dysfunction is treated in the conventional manner, the dysmenorrhea disappears and satisfaction is voiced in the vast proportion of cases. For this reason it is called "goiterous dysmenorrhea."

From whence came the term "interstitial thyrotoxicosis"? Two observers independently recognized and described a certain type of goiter associated with a mildly chronic hyperthyroidism; Goetsch¹ designated it "diffuse adenomatosis" to demonstrate the idea that it was primarily a goiterous affliction and Hertzler² called it "interstitial goiter" in the sense that it was a pluriglandular compound in which the thyroid manifestations were secondary. At a later date, the latter³ established its intimate relationship to dysmenorrhea and termed the clinical picture "interstitial thyrotoxicosis."

The fact that dysmenorrhea is only a symptom, and not a definite clinical entity, necessitates a description of the endocrine disturbance with which goiterous dysmenorrhea is associated.

INTERSTITIAL THYROTOXICOSIS

Symptomatology.—After once it is recognized, the symptom complex is fairly characteristic. Most of the cases occur in the female between the ages of sixteen and thirty years, there being, however, no age limit. These patients can usually antedate the onset of their trouble.

The outstanding clinical features are the mild chronic hyperthyroidism, nervous instability, pelvic dysfunction including pains in the right lower quadrant of the abdomen so commonly diagnosed "chronic appendicitis," and an underdeveloped skeletal build and genital tract.

Pains in the right lower quadrant of the abdomen, so frequently diagnosed "chronic appendicitis" in women afflicted with this endocrine disturbance, have been proved time and again to the satisfaction of this clinic to be symptomatic of ovarian dysfunction. In as far as the existence of the mythical "chronic appendicitis" is concerned, it is impossible to conceive how the processes of fibrosis in repair and advancing age can cause the symptoms that warrant its designation; furthermore, the end-results of appendectomy for its relief are more than convincing that too many innocent appendices are mislabeled.

There are two forms of interstitial thyrotoxicosis as recognized by Hertzler, namely, the true and pseudotypes. That which differentiates them is the skeletal build and the response to medical therapeutic measures. The true type has a physique that indicates maldevelopment, while the pseudotype occurs in well-developed girls and adults of normal constitution who shortly after treatment or marriage become normal individuals.

Chronic Hyperthyroidism.—The systemic manifestations of hyperthyroidism are mild and chronic. Occasionally when associated with metabolic disturbance, there is seldom seen the loss of weight in the thyrotoxicoses. The basal metabolic reading is normal and well within the percentage of error. The pulse rate seldom exceeds 120 per minute. The blood pressure is lowered. With the least exertion there is tachycardia, palpitation and shortness of breath. The tachycardia is more apparent during the forenoon. These patients are always tired, morose during the early hours of the forenoon, in fact they arise tired. Eye signs are never present. Tremors that are either fine or coarse are seen in the abducted and extended fingers. There are slight elevations in temperature that make one suspect a tuberculous process somewhere in the body. The white blood cell count hovers around what may be considered beginning leucopenia. The Goetsch test is invariably positive and never is the reaction like that of goiterous disease.

The palpatory findings of the goiter responsible for the associated thyroid dysfunction are best preceded by what is to be considered characteristic of an apparently normal functioning thyroid. Cabot states that the normal functioning thyroid is not palpable. He is correct with one exception that the gland in slim-necked individuals at the age of puberty and adolescence is easily palpable. Palpation is often deceiving as to actual size in that a large gland in short-necked and obese individuals may be just palpable. The consistency of the

palpable normal thyroid is never any more than soft and elastic. Its approach to firmness predicates toxicity and to actual hardness either malignancy or inflammation.

The interstitial goiter is somewhat uniformly enlarged though not always perfectly symmetrical. Its consistency is firm and elastic. Seldom is there the softness or mobility of the simple colloid goiter. Palpation often reveals lobulation, but never bosselation (nodulation). Coincident fetal adenomas may give one the impression of existing bosselation. Enlargement is not always clinically apparent and even so the consistency of the gland, which is the more important of the two, helps verify the diagnosis. The gland is often tender to the touch. Pulsation with arterial murmurs is never present in the neck.

Nervous Instability.—The nervousness is more that of neurasthenia and its allied disorders never approaching that seen in the thyrotoxicoses. It is that of irritability; these patients are nervous and impatient, and they are easily disgusted with themselves. It is in good faith that they seek medical aid and never do they assume the attitude of defiance seen in the neurotics who delight in telling of the many unsuccessful attempts to bring about their relief or cure. There is no question of doubt that these patients possess an inherited nervous system of inferior quality. So many of these women complain of choking sensations in their necks that are functional in that they are symptomatic of an inferior nervous make-up. It is highly probable that many of the nervous conditions similar to neurasthenia and its allied disorders are unrecognized cases of mild chronic hyperthyroidism. Bizarre psychical manifestations add color to the clinical picture. Mental depression is common, the melancholic type especially manifesting suicidal tendencies which often terminate fatally.

Pelvic Dysfunction.—On examining 100 consecutive unselected cases of interstitial thyrotoxicosis occurring in the female, Hertzler⁴ found 87 to have pelvic dysfunction. Seldom is there seen a functionally or anatomically normal pelvis in these women, inflammatory lesions being excluded. Pelvic dysfunction, so characteristic of this endocrine disturbance, is indeed not as frequent in the thyrotoxicoses. The pelvic abnormalities are coincident in that their surgical correction for the relief or cure of dysmenorrhea is disappointing to say the least. Uterine displacements are the most frequent anatomical offenders. The uterus is usually small, its cervix is conical and the external os is pin-point in size.

Not quite one-half of the women suffering this disturbance have dysmenorrhea that is equally either of the ordinary or unusual types. The dysmenorrhea is described either as painful or crampy in character and occurs just before or during the menstrual cycle. In many

the pain is severe enough to incapacitate them and make the bed their best friend during menstruation.

The menstrual periods are more often regular than irregular. When irregular, they readily become regular on medical therapeutic measures in more than the vast proportion of cases. There is no relationship between menstrual pains and menstrual periodicity. In fact the dysmenorrhea may be severe enough to incapacitate the patient and at the same time menstruation be regular in periodicity, and vice versa. More complain of scanty than excessive menstrual flow.

There is nothing typical about the menstrual pain. The lower abdomen, including the outer quadrants, is more commonly affected. When so, the right side manifests the most discomfort. Next in frequency are pains in the outer quadrants of the lower abdomen and of these the right side is the more frequent offender. The pelvic distress and pain often follows the topographical distribution of ovarian pain, namely, radiation over the hip, to the iliac crest or down the thigh.

At times the breasts of these patients are painful just before or during the menstrual cycle. The older school of surgeons were cognizant of an existing relationship between the breasts and pelvic dysfunction, ovarian in origin, and they did oöphorectomies to prevent the further progress of breast cancer.

About 32 per cent of the women suffering interstitial thyrotoxicosis are bothered with pains in the right lower quadrant of the abdomen that are too often diagnosed "chronic appendicitis." In fact these pains occur frequently enough to lure the inexperienced and pecuniary surgeons to their happy hunting grounds, the lower right quadrant of the abdomen, in search of the innocent prey they call "chronic appendicitis." Similar pains, except for their topographical distribution, frequent the left side, but not as often. These pains may be present independent of the menstrual cycle and, when so, are exaggerated during menstruation. Periodicity of menstruation has no direct bearing on the intensity of the pain.

Pathology.—Interstitial goiter is one phase in the diseases of the thyroid gland which, to the present day, is sadly neglected. Goiterous disease occupies the minds of most investigators and their contributions to the literature are indeed voluminous. Just what the relationship of interstitial goiter is to goiterous disease and lymphatism remains to be seen. The fact that these cases are no longer operated on in this clinic, for reasons to be shown later, and that investigation is lacking along this line makes it impossible to make any definite statements other than to give facts as observed in this clinic.

The thyroid is uniformly enlarged and somewhat symmetrical. This enlargement is usually twice the size of the normal gland. Its pinkish

to reddish-brown color resembles that of the hyperplastic goiter. Friability and vascularity are more apparent at the operating table than in the laboratory. A pericapsular fibrosis envelops the gland and makes its delivery difficult for the surgeon. There is lacking the smooth and glistening capsule seen in the colloid goiter. The external surface is often lobulated, but never bosselated. The consistency is firm and elastic (rubbery), approaching nowhere near the firmness to hardness of the more toxic goiter. The gland cuts like rubber. The cut surface is reddish-brown in color and diffusely granular. Fine trabeculae divide the parenchyma into small lobules of various dimensions and outlines.

Unlike the low columnar and cuboidal cells lining the original acini of the hyperplastic goiter, its corresponding cells are flattened out circumferentially, making the nuclei appear spindle-shaped. The cytoplasm of these epithelial cells is scant and their nuclei stain poorly with basophilic dyes. The papillary projections of clusters of columnar cells so characteristic of exophthalmic goiter are never seen. All acini are filled with a compact homogeneous colloid substance that stains eosinophilic and closely resembles coagulated egg albumen in consistency. The tinctorial reaction of the colloid is uniform throughout the gland. Secondary degenerative changes are seldom if ever seen.

Newly-formed acini and so-called "interstitial" cells, forming what is known as a "hypertrophic reaction" and similar to that seen in goiterous disease, are diffusely distributed throughout the gland. Lymphoid accumulations, with or without follicles, quite frequently complicate the picture.

At the interacinar angles are polyhedral areas peppered with interstitial cells. Otherwise these cells are seen in the remainder of the intralobular connective tissue. The term "interstitial" is used to describe the anatomical distribution of these cells and it is not to be confused with the terminology of the endocrinologist who uses the term to designate those cells giving forth a definite hormone concerned in the processes of internal secretion.

With the exception of the newly-formed acini, interstitial goiter finds its exact prototype in the gland of the young somewhere before the age of five years. Here the cytoplasm of the interstitial cells is scant and not very definitely outlined. Their nuclei are large and either round or ovoid and the nucleoplasm appears vesiculated in that it contains many chromatin granules. Except for their shape and increased amount of cytoplasm, the epithelial cells of the newly-formed acini are similar to the interstitial cells.

Other infrequent types of interstitial goiter are seen. Very confusing indeed is the type which, unlike the usual variety, shows a cellular

proliferation within the original acini that makes it similar to the hyperplastic colloid goiter. Microscopically it is impossible to differentiate the two goiters. The postoperative clinical course alone differentiates them, the interstitial type of goiter not being benefited by thyroidectomy.

Much more infrequent is another type in which there is a very marked proliferation of fibrous connective tissue in the interstitium. Here the so-called interstitial cells are replaced by endothelial-like cells. The microscopic picture closely resembles that of fibrocystadenoma of the breast, except for the presence of colloid material. This type is not to be confused microscopically with the thyroid of the aged that shows the same interstitial fibrosis.

Our knowledge of the pathology of the ovaries is too meager to permit any extensive description of the ovarian pathology associated with interstitial thyrotoxicosis. In fact Hertzler,³ as a resident pathologist for twenty years in a hospital where the operators removed ovaries on any pretext, the chief indication of which was for the relief or cure of dysmenorrhea, learned to divide such ovaries into three groups; wholly normal, ovaries with inflammatory lesions, and atrophic ovaries. The first type he found to represent about 95 per cent, the second about 4 per cent, and the last about 1 per cent.

The gross appearance of the ovaries indicates a hypoplastic process. Routine examination of such ovaries while operating within the abdomen for other conditions reveals them to be small, sclerotic, wrinkled on the surface and scarce in graafian follicles.

That the pituitary gland is involved is seen in the typical skeletal build and genital underdevelopment and just what the pathology is remains unsolved.

Diagnosis.—Space will not permit any lengthy discussion on the diagnosis of this disorder. Let it suffice to say that the differential diagnosis includes incipient tuberculosis, chronic hyperthyroidism proper, organic pelvic disorders, psychasthenia, psychoneurosis, effort syndrome, neurasthenia, neurocirculatory asthenia, and even chronic infections.

Should a patient return to the surgeon after the removal of a mildly chronic toxic goiter and complain of the original symptoms for which thyroidectomy was performed, the surgeon should suspect the interstitial type of goiter, review the microscopic sections and he will, in all probability, find out why his patient returned. If the surgeon is laboratory-wise, he will many times diagnose interstitial goiter long before the postoperative clinical course of the disease decides for him.

In the type of interstitial goiter resembling the hyperplastic colloid goiter, the microscopic section easily satisfies the surgeon that he has

removed an offending goiter on its ultimate journey to either the chronic toxic or exophthalmic stages of goiterous disease and just as easily is he dissatisfied later with the end-results of thyroidectomy. It is in this type that the clinical course of the disease after operation is alone his "sheet anchor."

Likewise, should the surgeon prematurely correct any pelvic abnormality, inflammatory lesions being excluded, without beneficial results, he should suspect interstitial thyrotoxicosis. He may find much to his surprise that that which he operated for to be nothing more than the symptoms of this endocrine disorder.

Likewise, the persistence of symptoms following operation for the cure of "chronic appendicitis" should make the surgeon suspect interstitial thyrotoxicosis or intercostal neuralgia (Carnett's syndrome).

Treatment.—The relief or cure of interstitial thyrotoxicosis and its associated dysmenorrhea is never to be found at the operating table. The results of subtotal thyroidectomy for the cure of hyperthyroidism and the results of corrective surgical procedures within the pelvis for the relief or cure of dysmenorrhea are very unsatisfactory to say the least. It is true, however, that subtotal thyroidectomy does at times temporarily relieve the hyperthyreosis and at a later date, months or even years, these patients return worse off than before. Their response then to medical therapeutic measures is more discouraging.

Before proceeding with the treatment advocated at this clinic, it may be well to challenge the work of the roentgenologist who needlessly employs the roentgen ray in the treatment of the chronic hyperthyroidism and dysmenorrhea. Roentgen rays showered at the ovarian regions temporarily relieve the dysmenorrhea and overexposure brings the patient back, within a relatively short time, with a resultant climacteric that is worse than the original affliction. The roentgen-ray treatment of the goiter offers only temporary relief of hyperthyroidism and has no material effect on the associated dysmenorrhea.

Medical treatment, including proper hygiene and rest, offer by far the most encouraging results. When the goiter is treated in the conventional manner, the hyperthyroidism, dysmenorrhea, some of the nervous instability, and pains in the right lower quadrant of the abdomen so commonly diagnosed "chronic appendicitis," disappear in the vast proportion of cases. Often after what may be considered an apparent cure these patients may continue to be more or less nervous, but this is to be expected considering the inherited inferior nervous systems possessed by these unfortunates.

The treatment advocated is by no means a panacea. It can be improved upon, but nevertheless, it has given results in this clinic that are worthy of mention. The response to treatment is not as good

after once the age of twenty-five years is reached. Let it be understood that this age is not considered the maximum age limit beyond which the restitution to normal by medical means is no longer possible. It is never to be forgotten that these women are sick individuals and should be treated as such.

It is my opinion, as well as that of Hertzler, that the primary source of this endocrine disturbance is ovarian in origin. Unfortunately there are not enough reliable medical therapeutic measures at our command to treat this primary source. Ovarian extract and corpus luteum are ineffectual. In that the pathologic picture of the associated goiter declares a hypofunction and that clinical experience indicates that iodides whip the thyroid into activity, potassium iodide is given to stimulate its further function. It is interesting to note in this connection that older clinicians treated dysmenorrhea empirically with potassium iodide. It is possible that this stimulation is brought about by the effect of the iodide on the flattened-out and apparently inactive acinar cells. Smaller dosages of this drug are just as efficacious as larger ones, even then they may be too stimulating.

Sedatives are combined with this stimulant to minimize its effect on the nervous system. Sodium bromide and the fluidextract of hyocyamus are about as satisfactory as any of the sedatives. Bromidism is prevented by the addition of small amounts of Fowler's solution. Should there be constipation a little cascara may be added. In the more nervous individuals, the stimulating effect of the iodide is best preceded by sedatives only. With the diminution of nervous symptoms, the iodide is then started. Many times small dosages of potassium iodide are too stimulating even though preliminary sedatives have been given. Milder stimulants as thyroid extract or the syrup of iron iodide are then substituted. Should a skin rash or an upset stomach bother the patient, luminal is substituted temporarily for the bromide and hyocyamus. It is best, however, to stay with the iodide as long as possible. A more or less standardized prescription used in this clinic is:

| | Gm. or c.c. | |
|---|----------------|-----------|
| R Potassii iodidi | 8 | 3 ii |
| Fldext. hyocyami | 12 | 3 iii |
| Liq. potassii arsenitis | 12 | 3 iii |
| Sodii bromidi | 48 | 3 iss |
| Rubelixir | q.s. ad 240 or | fl 3 viii |
| M. Sig.: Take one teaspoonful in water three times a day after meals. | | |

This medication is continued indefinitely until there is admitted improvement, when it is given twice a day and continued at the discretion and to the satisfaction of the physician. It should be remem-

bered that it takes anywhere from six to eighteen months to effect a cure. There are cases, however, in which cures are effected even over periods longer than eighteen months.

It is best to wait at least six months or more to see what effect medical treatment has on the associated dysmenorrhea before proceeding with any surgery to correct coincident anatomic lesions in the pelvis for its relief or cure. Then anything reasonable may be tried, advising the patient that the corrective operation is compatible with good health and necessary whether or not it relieves the dysmenorrhea. The percentage of cures following these corrective surgical procedures is extremely small. By so advising his patient, the surgeon can protect himself from what is most embarrassing, the persistence of the dysmenorrhea after earnest surgical effort.

Just what is the clinical course of interstitial thyrotoxicosis under treatment? After what may be considered an adequate amount of treatment, the rapid pulse is the first to subside, oftentimes this may require only several weeks. Nervous equilibrium is next reached and next the goiter disappears. It is then that irregular menstrual periods become regular to precede the final disappearance of the dysmenorrhea and pains in the right lower quadrant of the abdomen so commonly diagnosed "chronic appendicitis." Quite frequently the latter pains disappear long before the dysmenorrhea.

Before drawing any conclusions I wish to say for the sake of argument that the therapeutic nihilist may say that these patients get well whether or not the prescribed medication is taken, but the fact remains that these patients get well and are better off without any surgery.

CONCLUSIONS

1. Medical therapeutic measures relieve or cure the vast proportion of cases of dysmenorrhea associated with interstitial thyrotoxicosis.
2. Goiterous dysmenorrhea is a functional disorder for which there is no surgical or roentgen-ray treatment.
3. If interstitial thyrotoxicosis is recognized more often, many needless thyroidectomies, appendectomies and pelvic operations will be unheard of.
4. Pelvic abnormalities, inflammatory lesions being excluded, are coincident to goiterous dysmenorrhea and their surgical correction for the relief or cure of dysmenorrhea are failures in the overwhelming proportion of cases.
5. Pains in the right lower quadrant of the abdomen associated with interstitial thyrotoxicosis and so commonly diagnosed "chronic appendicitis" are symptomatic of ovarian dysfunction and they disap-

pear, as does the dysmenorrhea, under medical therapeutic measures in the vast proportion of cases.

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Kermauner, F.: Genital Bleeding in Young Girls. Wien. klin. Wchnschr. 42: 297, 1929.

Fully 50 per cent of girls during their period of development bleed irregularly. This irregularity, however, is not very serious since in the great majority of cases it is transitory.

In cases of continuous bleeding following the initial period, a careful blood examination should be made. A blood disease such as leucemia is very often the cause. Repeated pelvic examinations by rectum must be done. A slow growing benign or malignant tumor may be discovered months after symptoms have appeared. General disease conditions may be causing the bleeding, such as tuberculosis, typhoid, "grippe", pneumonia, in fact all acute and chronic infectious diseases. Acute appendicitis, and both hereditary and acquired syphilis fall within this category.

The rôle that genital hypoplasia plays in the process is difficult to determine. The ductless glands should be investigated. A disordered relationship may act by disturbing maturation of ovum, by injuring blood vessels, or by producing vasomotor changes. In hypo- and hyperthyroidism suitable treatment might result in regularity of menstrual flow. The hypophysis seems to be even more important. The part that the adrenals and other organs play has not been determined.

The "constitution" of the individual may vary. All types, the asthenic, hypoplastic, obese, large, small, etc., can be affected. The type seems to have no significance.

In treatment, the first requisite is the general care of the patient, measures including fresh air, sunlight, rest, attention to bowel elimination, and diet. Climatic changes are especially stressed. Another measure strongly recommended is the correction of static-dynamic decompensation, by such measures as rest in bed or the wearing of compensatory belts, in the hope that the symmetrical distribution of weight will correspondingly cause a symmetrical distribution of blood and in this way perhaps prevent injury to blood vessel walls.

Iron in large doses (6-8 grains daily), strychnine, hypophysis and ovarian preparations, the latter especially when a true genital hypoplasia is present, have been found efficacious. X-ray may be employed to the spleen, hypophysis, and thyroid. X-ray to the ovaries should be avoided as long as possible in the hope that some cause for the bleeding will be found.

Curettage may be performed in some cases but lasting results are not to be expected. Hysterectomy should never become necessary if every therapeutic measure available is used. The primary aim should be to stop the bleeding, rather than regulate the cycle.

FRANK SPIELMAN.

OBSERVATIONS ON A SHORT SERIES OF PLACENTA PREVIA
PATIENTS DELIVERED BY ABDOMINAL CESAREAN
SECTION AT THE BOSTON LYING-IN HOSPITAL*

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IN 1921 I published a study of 218 consecutive cases of placenta previa treated at the Boston Lying-In Hospital from 1895 to 1919 inclusive. From 1895 to 1915 the maternal mortality was 19 per cent. During these years the method of treatment was version and immediate extraction. From 1915 to 1919 when conservative delivery, bags, or Braxton Hicks version and slow delivery had quite considerably displaced the older method (about 60 per cent), the mortality dropped to 6 per cent, and it was confidently predicted that as these methods were increasingly adopted and more carefully executed the mortality would be reduced still further.

In 1926, five more years having elapsed, during which the series reached 303, an attempt to substantiate this prediction was made. Truly enough conservative methods of delivery had risen about as high as is possible in a hospital handling emergencies (76 per cent) but I was obliged on the findings to reach the following conclusions:

"In spite of previously held opinions, and in the face of the opinions now held by those for whose obstetric judgment I have the most regard I am forced by this study to these conclusions. That all central and partial previas are best treated by low classical abdominal cesarean section, whether the baby be viable or nonviable, living or dead. That marginal placenta previa is best treated by the Voorhees bag. That moribund or very sick patients with placenta previa should be rested and quieted with morphia, bleeding controlled by necessary methods, including tight cervical and vaginal pack and pressure over and above the fundus; transfused, operated as above on pulse and pulse pressure reaction, and retransfused. It should always be the effort to ascertain as nearly as possible how much blood has been lost and to replace that amount as nearly as possible. That hysterectomy following section should be frequently practiced, each case to be considered by itself on the following grounds: risk of sepsis from previous history, persistent bleeding following the section, and number of dependent children at home. If a woman has several as is usually the case, and hysterectomy seems to improve her chances, it should unhesitatingly be done."

These opinions were based on the negative evidence of our statistics and on a study of eight points specially considered, too long to reconsider here in detail, concerned with the causes of death in placenta previa in relation to methods of delivery from below. A consideration of the causes of death in the series made it appear that the main

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causes, namely ruptured uterus, hemorrhage, and sepsis could be avoided by section, at least theoretically. Two points in our statistics may be stressed: (1) The maternal mortality in complete previa, 1910 to 1915, 36 per cent, 1915 to 1920, 18 per cent, and 1920 to 1925 and six months, our most conservative period, 25 per cent. It seemed impossible to get worse results by cesarean section. The second may be quoted from the paper. It concerned infant mortality.

"I have taught for many years that the baby in toxemia with convulsions and in placenta previa is of secondary importance. If you save it, so much the better; if you do not and save the mother, you should be satisfied. That no consideration for the baby should alter the treatment against the mother in conditions in which there is so high a fetal mortality in the nature of the disease has been insisted upon. I still believe this in principle, but I am questioning whether in placenta previa, by sacrificing the baby, we are so often saving the mother per se. An analysis of fetal deaths in these five and one-half years, with its 25 per cent complete and its 10.5 per cent general previa mortality, leads me to question this. This analysis shows that in 85 cases 46 infants died or were born dead, a fetal mortality rate of 54 per cent. Twenty of these 46 dead infants either had no fetal heart sounds or weighed four pounds or less. In 3 the weight was not stated. Twenty-three, or 50 per cent of the dead infants, had fetal heart sounds and weighed more than four pounds (many six pounds or more) at stillbirth. We lost 27 per cent of the babies of the 85 mothers either for nothing or to save more mothers, according to the point of view. Of 85 babies, 23 died who might have lived if they had not been subjected to delivery from below. Again I only question whether our maternal mortality justifies this."

In 1931 a new five year period can be studied which may throw some light on the *comparative* values of our methods at present in practice, but it will be 1936 before enough material has accumulated to make this comparison of real value. This statement is put in here to delimit this paper to the title under which it is being read.

About the time my former paper appeared, Irving made a study of his own personally conducted or supervised cases, a considerable series (*Surgery, Gynecology, and Obstetrics*, December, 1927). He found his maternal mortality excellent by conservative delivery from below, mostly Braxton-Hicks version and delivery largely by the patient's own efforts. He was however impressed by the high fetal mortality in perfectly good babies by this method. Furthermore he believed that certainly or potentially infected cases would be wisely treated by abdominal section and supracervical hysterectomy. Chiefly he felt that cesarean section for placenta previa is the baby's operation and hence, since his results from below were excellent, saw no value in section unless the baby was "probably good."

Shortly after this time Dr. Newell in a discussion of cesarean section before the Massachusetts Medical Society expressed the belief that abdominal section had a place in the treatment of placenta previa. He

felt however that it was not necessary or wise except for a "probably good" baby, and that it would not save the moribund placenta previa cases.

Various other members of the staff had reached conclusions somewhat similar to these if we may judge by what transpired in the years subsequent to 1926.

Prior to 1925, a long time back, a cesarean section was once done on a moribund woman with placenta previa and she died. She is not included in this series. In 1925 a cesarean section was done on a primipara with a partial placenta previa and a rigid os. She recovered. She is not included in this series as this indication has always existed even in the most conservative minds. In 1926 no cesarean sections were done for placenta previa. From then on a reasonable, or possibly unreasonable, amount of enthusiasm for this procedure in this condition has developed and it appears to be growing. For example, in 1927 of 10 complete and partial previas, 4 were sectioned, 40 per cent. In 1928 of 5 complete and partial previas, 4 were sectioned, 80 per cent. In 1929 of 11 complete and partial previas 9 were sectioned, 82 per cent. So far in 1930, 1 complete previa has been sectioned; and for good measure 4 marginal previas have been sectioned during these years against 22 delivered from below.

We have then a series of 22, 14 complete, 4 partial, 4 marginal, for consideration. These sections were done by seven different staff men and several different residents, so results are comparable in this respect with our older statistics which were done by many different staff members, residents, and house officers.

Let us dismiss the marginal group first, four in number. Except that one was a primipara nothing in the other records show that any of them needed a section. One we suspect was done on the rebound from the death of another previa delivered from below, seemingly the result of a mental process which attacks most of us in obstetrics one time or another. I am still of the opinion that marginal previas should not be sectioned unless they are probably infected. In this case a section and a supracervical hysterectomy is my choice. A primiparous marginal previa patient I might section or not depending on how she behaved. The risk of section is greater I believe than the risk of death from the condition in an ordinary multiparous marginal placenta previa patient.

About 80 per cent of the cases were in para iii to v or para v plus groups, equally divided, so that if hysterectomy had been needed for reasons suggested above there was little social objection to it in most of the cases.

The whole group was in at least fair condition when operated upon, most of them in good condition, therefore no light is thrown by this

series on the question whether treatment and section as outlined above on cases entering the hospital *in extremis*, is of value.

Eighteen cases had low classical cesarean sections, one patient had this procedure with hysterectomy, one had it with tubal ligation. One had a Beck and one a modified Kerr, i.e., transverse incision in lower segment, after stripping down the bladder peritoneum. Comment on these will be made later.

The question of bleeding at or after the operative procedure is of interest since the cardinal principle of treatment of a patient already bled is the conservation of all the rest of her blood, a condition often not satisfied by delivery of placenta previas from below. In 12 cases it is specifically stated in the records that there was no bleeding at operation or after, in two nothing is stated so we may assume it was not excessive, in five the bleeding was slight requiring nothing but routine pituitrin administration to stop it. In one instance suture at the placental site was deemed necessary and this stopped the bleeding, transfusion was not necessary. Two cases deserve special mention. No. 5 was a Beck operation. The note reads "Profuse bleeding continued from placental site in lower segment on posterior wall. Patient in poor condition, pulse thin and barely perceptible." No. 10 was a "Modified Kerr"; the note reads, "Bled profusely after baby out, forced to remove placenta, then bled profusely. Condition poor at close of operation." Both these patients recovered. Since one of the less spoken of arguments for cervical section is that it avoids the site of the normally implanted placenta and so conserves blood, it seems logical that if the placenta is situated in the lower segment an incision above this area is indicated. This is borne out since only in these two cases in which the section was started with the patient in good condition did the patient leave the table in poor condition from hemorrhage. It is our practice to wait in cesarean section and let the placenta separate whenever possible. From experience with both methods we know this results in much saving of blood in all cesarean sections.

The matter of bleeding may also be checked by the record of transfusions. Every placenta previa is of course grouped immediately and Group IV donors are readily available for emergencies. In eighteen of these twenty-two cesarean sections, transfusion was not necessary. Three had a single 500 c.c. transfusion, one had two transfusions 1000 c.c. in all. One had a transfusion late in the puerperium for sepsis and low hemoglobin and red count. Of the four patients requiring transfusion for hemorrhage, one was the Beck section, one the Kerr, and two had bled severely on vaginal examination. We will go so far as to submit that this is a very low transfusion rate for placenta previa of these types.

We may now consider the question of fetal mortality in this series. Three babies died that weighed less than 4 pounds. Two babies died that weighed over 4 pounds; one of these weighed 5 pounds, 15½ ounces and was six weeks premature, the other weighed 4-5 and was nine weeks premature. Eighteen babies (twins in one instance) lived. If we take the arbitrary standard of four pounds, irrespective of prematurity, as we did in the previous paper we find that in this cesarean section series, 18 live babies were obtained out of a possible 20, a mortality of 10 per cent, as against 40 per cent in the series of deliveries from below.

Irving noted particularly the high septic morbidity in his study, and most of us have been impressed with the stormy convalescence of many of our placenta previa cases delivered from below. Sepsis is a common enough cause of death in placenta previa. Ten patients of this series had no fever in the puerperium, six had a "slightly febrile convalescence," four had a "febrile convalescence," and one was definitely septic and sick but recovered. Three patients Nos. 1, 2 (my own), and 6, para vii, vi, and ix respectively, probably should have had hysterectomies on their history. One of these became profoundly septic, one ran a distinctly febrile convalescence, and one was afebrile.

Seventeen patients were examined vaginally, with or without anesthesia, in two records no statement is found, and three patients were operated upon without vaginal examination. In several instances severe bleeding is noted after vaginal examination; once packing was done while waiting preparation for cesarean section. We will return to this later.

Of the twenty-two cases one mother died. This case illustrates the points I wish to make so I will quote her record.

No. 41932, E. B., twenty-two years, para v. Feb. 26, 1926. She had had three normal deliveries and one miscarriage. She had a slight staining one month ago and was put to bed by a visiting nurse. There was profuse bleeding one hour before entrance to hospital and oozing continued. Pulse 120, blood pressure 110/34. Bagging kit was prepared and instruments were assembled for possible laparotomy. Gas examination, profuse bleeding. During preparations patient bled at first severely, then oozed. Low classical cesarean section was performed. Little bleeding with and after placenta. Patient was in poor condition, transfused 400 c.c. citrated blood, then 600 c.c. more. Blood began to ooze from uterus and the patient died. Baby weighed 3 pounds 10½ ounces, nine weeks premature, died. Autopsy in mother showed death due to exsanguination. The lower uterine segment was flabby and the interior surface was very irregular with large projecting fragments of tissue and blood clot. This surface was somewhat trabeculated and extended all around the uterine cavity. Microscopic examination showed the decidual tissue attached directly to the myometrium.

COMMENT

This series of 22 placenta previa patients delivered by cesarean section is too small to use as a basis of comparative value of methods of

treatment in our whole series which now is approximately 375. Many men of experience have delivered more previas than this by other methods without a maternal death. It seems fair however for us to attempt to learn something from our small accumulated experience with this method. Accordingly the following conclusions are presented based upon this study.

CONCLUSIONS

1. Abdominal cesarean section has apparently been accepted as one method of treating cases of placenta previa at the Boston Lying-In Hospital. The indication there is broader than the earlier one of a primipara with a rigid cervix, and differs according to different personal ideas.

2. Nothing in our experience with this procedure to date leads to a feeling that it should be abandoned without further trial.

3. The amount of material to date does not permit of a comparison with our other methods at this time.

4. Incision in the fundus somewhat higher than the usual low classical incision (but entirely below the umbilicus) seems indicated rather than any type of cervical section.

5. The relative incidence of bleeding and sepsis seems satisfactory so far by cesarean section.

6. Ruptured lower segment and cervix do not occur.

7. Apparently the fetal mortality is improved by this method.

8. Probably more patients should have hysterectomies after cesarean section than we have been doing thus far.

9. The occasional occurrence of placenta increta in association with placenta previa should ever be borne in mind. The treatment of this condition is hysterectomy. This was brought out by Hofmeier and reemphasized by me in my second paper.

10. It is probably justifiable to section a few suspected placenta previas without vaginal examination, on the history and bleeding when seen.

11. If as is usually the case, an obstetrician intends to examine a patient vaginally for diagnosis with a possibility of doing a section, he must have not only the kit for bagging or packing boiled and at hand, but as well the cesarean section room must be set up with instruments boiled and set out on the table, nurse and assistants scrubbed and ready for immediate operation. This will many times result in an unnecessary preparation, but will occasionally save a death, or excessive blood loss with the necessity for transfusion and the added risk of sepsis. This is well shown in this series. It is my practice since I determined to section all central and partial previas to have two

operating teams ready before the examination is undertaken. If the case proves to be a marginal, team one (the examiner) then bags the patient; if it proves to be a central or partial, an immediate section is done by team two. In this way no unnecessary blood is lost. This rule should be applied whatever the given operators' indication for or against cesarean section in placenta previa may be. This conclusion is we believe the most important result of our experience with this series. If it is impossible to have prepared the operating room or if this has not been done by mistake it is wise to give up the idea of section and forthwith proceed with the initial steps of conservative delivery from below.

12. Although such a conclusion is not justified by this series, I believe the best chance for a previa *in extremis* is that outlined in my previous paper: tight pack, pressure on and over fundus, morphia, transfusion, section on reaction, hysterectomy, retransfusion. This impresses me the more as I regard in retrospect the manner in which an atonic uterus in a nearly dead woman may ooze out (whether packed or not) the second and third transfusions of blood. Beyond a certain point foreign blood does not save such patients. Only in the specimen basin is such a uterus safe.

Since this paper was written four more cesarean sections have been done at the hospital for placenta previa, all in March of this year, bringing our series to twenty-six with no additional maternal deaths. Two were partial, two marginal. One had a Kerr transverse cervical. She was hysterectomized for persistent bleeding together with the fact that she had already had two high sections for pelvic disproportion.

Six cases out of the twenty-six cases sectioned were marginal. Since there is nothing in our study of the whole series to justify cesarean section for uninfected marginal placenta previa for the mother these must have been done for the baby; the fetal mortality by our methods having been high in marginal previas. On consideration we feel this is due to our use of bags and Braxton-Hicks version in this group. Therefore, for a time at least, in the future, I will routinely deliver *marginal* placenta previas by rupture of membranes, and pack if necessary, attempting to get normal deliveries and low forceps, thus hoping to obtain a better and reasonably good fetal mortality while at the same time avoiding the cesarean section risk to the mother. I will resort to the bag or Braxton-Hicks version only when bleeding is not controlled. And I will continue to section *partial* and *complete* previas until such time as material warrants a comparative study of results.

✓ DELIVERY THROUGH THE NATURAL PASSAGES FOLLOWING CESAREAN SECTION

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THE dictum "Once a cesarean always a cesarean" is taught and followed in clinical practice in many of the recognized obstetric clinics. On this service, however, a delivery through the normal birth canal after a cesarean section is seen so frequently as scarcely to be a matter of remark. I have, therefore, investigated all the cases of this character that have been on the obstetric service of the Johns Hopkins Hospital between January 1, 1925, and April 1, 1930. / All patients who come to our dispensary with the history of a previous cesarean section are registered for delivery in the hospital and admitted about one week before the calculated date of confinement. They are followed very closely, and if the section was done for other indications than pelvic dystocia, a spontaneous outcome is expected. If, however, the section was done for a pelvic indication, the patient is always examined by Dr. Williams in a special clinic, when the type of delivery to be expected is decided upon after all factors have been taken into consideration. Sometimes the decision is not made until just before the expected date of confinement, and occasionally, when the degree of disproportion appears moderate, the patient is subjected to a real test of labor before a final decision is made.

In reviewing the literature on this subject, very few articles were found, including ten references during the past three years, of which three were in English, and the remainder in Spanish and French journals. Furthermore, several of the articles were merely case reports. The most complete study was made by Rice and appeared in the AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY for May, 1927. He reported a series of 96 patients, 76 of whom had subsequent sections and 20 of whom were delivered vaginally (21 per cent). In the discussion that followed this report, in which several of the leading obstetricians of New York took part, the consensus of opinions was that one cesarean usually merited another, and that the only method of decreasing the number of repeated sections was to limit the number of initial operations. Since the policy in this clinic is quite different from the above, a study of a series of cases of pregnancy following cesarean section was deemed advisable.

Wilson reported a similar group of cases from this clinic in 1926, when he was able to collect 138 cases of pregnancy following section who

were admitted to the Johns Hopkins Hospital from 1902 to 1925, and which occurred in 101 women. Sixty-nine per cent of the patients had a subsequent section; 27 per cent were delivered through the natural passages, and 3 had abortions. Our report begins January 1, 1925, and runs to April 1, 1930. Owing to the larger size of the clinic, we are able to report a relatively greater number of cases, as well as a larger number of deliveries through the natural channel in the past five years than in the preceding twenty-three years. It is interesting to note that Wilson's figures of 69 per cent of repeated section and 27 per cent of vaginal deliveries become 57 per cent and 39 per cent, respectively, in our series.

During this five-year period, 108 pregnant patients were admitted to the Johns Hopkins Hospital who had had a previous cesarean section. In 3 of them the pregnancy ended in abortion, so they are not considered here. Of the 105 remaining, 62 patients had another section, 26 were delivered spontaneously, and 17 were delivered by forceps, or by breech extraction. As we were particularly interested in the last two groups, we did not investigate the 62 repeated section cases.

We were particularly interested in the following points in the history of the original operation: indication for section, type of section, whether the patient had a test of labor, course of puerperium, weight of baby following section and following vaginal delivery, and its biparietal measurement, result to baby in both cases, the length of labor in vaginal delivery, moulding of head and type of pelvis. The patients were also studied in regard to race and age.

Of the 43 patients who were delivered vaginally 5 were not included in this report because the baby was premature, and thus precluded the possibility of disproportion. Of the remaining 38 patients, 16 were white and 22 colored. It is interesting to note that in the whites 6 of the previous sections had been done because of pelvic dystocia, and 10 for other indications, such as eclampsia, toxemia, placenta previa, etc., as compared with 14 and 8 cases, respectively, in the blacks. In none of the 38 cases did rupture of the uterus occur. The initial section had been done in this hospital in 23 patients, and elsewhere in 20. Of the sections done here, 15 were for pelvic dystocia and 8 for other reasons. Of those done elsewhere the indication was equally divided between pelvic dystocia and other reasons.

In the previous sections which could be investigated 5 had afebrile and 20 febrile puerperia. In 6 of the latter the febrile course lasted for three days, while in 14 it lasted longer. The condition of the scar at the time of vaginal delivery is difficult to determine from the records, but in certain cases it was noted as being definitely palpable and at times thin.

Of the 38 patients, 33 had one cesarean section and 5 had two. Five of the 38 had had spontaneous labors prior to their sections. The

age at which the section was done ranged from 15 to 38 years, with an average of 20.18 years. Only four sections were done on patients over 23 years old—at 24, 30, 35 and 38 years, respectively; the average age for the spontaneous labor following the section was 23.10 years, with extremes of 17 and 40 years. Two of the sections were of the low cervical type, two with the high midline incision, and the rest classical with the usual infraumbilical incision. Only seven of the sections were done after the onset of labor, and the rest were elective. In only one was a real test of labor given.

We will now turn our attention to the vaginal deliveries following section. As previously stated, none of the patients showed rupture of the uterus and there were no maternal deaths. The shortest labor in this group was 2 $\frac{1}{60}$ hours and the longest 49 $\frac{30}{60}$ hours, with the average duration of labor 15 $\frac{36}{60}$ hours. This, when we consider that for practical purposes most of the patients are primiparae, is a normal figure. Furthermore, in only three patients did the second stage last over one hour, the majority being around one-half hour. Of the 38 cases, 21 were delivered by forceps in which 12 followed sections for pelvic dystocia and 9 for other reasons 14 delivered spontaneously, 7 following sections for dystocia and 7 following sections for other reasons; the 3 remaining cases were delivered by breech extraction and in each of these the section had been done for other than pelvic reasons. The indication for the majority of the forceps deliveries was in order to save the uterine scar from added strain.

DURATION OF LABOR IN HOURS WITH NUMBER AND TYPES OF DELIVERIES IN PREGNANCY FOLLOWING SECTION

| 1 to 5 | 5 to 10 | 10 to 15 | 15 to 20 | 20 to 25 | 25 to 30 | 30 to 35 | 35+ |
|------------|------------|----------|----------|----------|----------|----------|----------------------|
| 5 | 7 | 11 | 3 | 4 | 1 | 4 | 2 |
| 2 Spont. | 4 Spont. | 6 Spont. | 3 Spont. | 3 Spont. | 1 Spont. | 1 Spont. | 2 Spont. |
| 1 Forceps | 2 Forceps | 5 For- | | 1 For- | | 3 For- | 1 Labor |
| 2 Br. Ext. | 1 Br. Ext. | ceps | | ceps | | ceps | 49 $\frac{1}{2}$ Hr. |

The result to the babies is very interesting. Of the babies obtained on section, 11 were stillborn or died before discharge, which is usually on the twentieth day; in this group are included two prematures who died at 2 $\frac{1}{2}$ months and 8 months, and a third who died at 6 months of hydrocephalus. Three of the section babies were discharged well but could not be traced later, while 24 were known to be well at least one year after birth. These figures include all the babies obtained prematurely when the section was done for eclampsia, pre-eclampsia, or placenta previa.

Of the babies delivered through the natural birth canal, only 1 was stillborn following a low forceps in which the total duration of labor was 45 $\frac{5}{60}$ hours. It is interesting to note that this patient had three

other deliveries through the natural passages following the section—one before and two following the death just mentioned. Fifteen of the babies were discharged well, but could not be traced later; while 22 were well at the end of one or more years. In considering the result to the babies, even after deducting the prematures delivered by section, there is hardly any comparison between the two groups of cases—a fetal mortality of 2.7 per cent being nearly ideal. As far as can be determined by a study of the case records, there was no excessive moulding of the child's head following vaginal delivery. Only one case of intracranial hemorrhage is recorded, and it eventually recovered.

Of the 38 patients studied, 25 are known to have had one vaginal delivery following section, 9 had two, 3 had three, and one patient had four such deliveries. The latter, who has been mentioned above, had two sections elsewhere because of a kyphotic funnel pelvis, but in this clinic she had four easy low forceps deliveries and three of the babies weighed more than those obtained by section. This patient finally returned to us in her seventh pregnancy with an unusually large baby; and for this reason a section followed by tubal sterilization was performed.

We were particularly interested in the patients who had vaginal deliveries following cesarean section for pelvic dystocia. In the other group of cases, assuming a normal pelvis, a normal presentation, an average-sized child, and a satisfactory union in the uterine scar, we see no reason for subjecting the patient to another section without a thorough test of labor. Gamble, in the *Bulletin of the Johns Hopkins Hospital*, 1922, has shown that under ideal conditions the muscle unites perfectly and its fibers cross the site of the incision as if it had never been made. From this ideal there are all gradations up to a scar of decidua and peritoneum alone. He has shown that in practically every case there is some continuity of muscle fiber across the site of the scar. If the section has been well done and there is no infection, the site of the scar should be practically as strong as the rest of the uterus.

On the other hand, in the group in which the section was done for pelvic dystocia, there is a much larger field for the exercise of refinements in judgment. The condition of the scar, the size of the baby, particularly the size of the head as patient approaches term, the amount of moulding that may be expected, which, of course, is greater in the negro than in the white, all enter into the consideration of the case. Finally, there is a certain nicety of judgment which comes only from experience, which enables one correctly to balance the interplaying factors, and permits a successful prediction of the course of labor.

In our series are twenty cases in which the previous sections were done for pelvic indications. Eleven of these had their sections and

| | UNIT NO. AND RACE | TYPE OF DELIVERY | WEIGHT | B.P. | MOULDING OF HEAD | RESULT TO BABY | DURATION OF LABOR | 2ND STAGE | PELVIS | C.D. | T.L. |
|-----|----------------------|--|--------------------------------------|------------------------------|--------------------------------------|--|---|---------------------------------|------------------|-------|-------|
| I | 11,124 White | Spont. C.C.S. Spont. Spont. | 3180 4180 3650 3500 | ? 10 9.25 9.25 | None None None None | Well 4 yr. Well 3 yr. Well 2 yr. Well | ? --- 5 5/60 4 55/60 | ? --- 28/60 34/60 | Simple Flat | 10.25 | 9.25 |
| II | 628 Col. | L.C.S. L.C.S. Spont. | 2575 3550 2700 | 9 9 8 | Moulded None None | Well 4 yr. Well 1 yr. Disch. Well | 27 36/60 9 25/60 13 50/60 | --- --- 45/60 | G.C.R. Funnel | 10.5 | 7.75 |
| III | 15,222 Col. | G.C.S. | 3440 | 10 | None | Well 1 yr. | --- | --- | Flat Rachitic | 11 | 8.25 |
| IV | 11,600 Col. | L.C.S. Spont. | 3840 3340 | 10 10.5 | Caput None | Well 1 yr. Well 1 yr. | 39 57/60 17 | --- 25/60 | G.C. Funnel | 10.75 | 7.75 |
| V | 278 Col. | G.C.S. Spont. Spont. Spont. | 3240 3040 3425 3500 | 8.75 8.5 9 10 | None None None None | Well 9 yr. Well 6 yr. Well 4 yr. Well 1 yr. | 2 23 54/60 8 4/60 9 10/60 | --- ? 13/60 10/60 | G.C.R. G.C.R. | 11 | 10 |
| VI | 7,595 Col. | G.C.S. C.C.S. Low For. | 3650 2790 3150 | 8 8.5 8.5 | None None None | Well 2 yr. Well 1 yr. Disch. Well | --- --- 13 48/60 | --- --- 53/60 | G.C.R. | 10.5 | 10.25 |
| VII | 133 Col. | G.C.S. G.C.S. Spont. Spont. C.C.S. | 3260 3490 3235 3500 3800 | 9.25 9 8.5 9 9.5 | None None None None None | Well 7 yr. Well 3 yr. Well 2 yr. Well 2 yr. Well 1 yr. | --- --- 9 6/60 21 15/60 --- | --- --- 21/60 ? --- | Flat Rachitic | 10.5 | 10.5 |

subsequent deliveries in this clinic; nine had the sections elsewhere. Some difficulty was encountered in obtaining from other hospitals data on the section and the result to the baby; those which could be obtained are reported. The eleven done here are reported in detail. We obtained data on two cases done elsewhere, which brings our total up to 13; and a table of these cases follows. The table itself is practically self-explanatory.

The following points may be emphasized: 11 of the sections were done for pelvic dystocia, while 2 combined a pelvic contraction with a breech presentation; 7 of the patients had elective sections, 6 of them tests of labor ranging from 2 to 39⁵⁷/₆₀ hours. Of the 7 who had elective sections, 5 subsequently had a larger baby per vaginam, and of the 6 who had a test of labor, 2 subsequently had a larger baby by the vaginal route. In 6 of the patients the delivery after section was ended by forceps in order to spare the uterine scar, and 7 had a spontaneous outcome. Two of the above patients had a spontaneous delivery before the first section. The duration of labor in the vaginal deliveries varied from 3⁵⁹/₆₀ to 23⁵⁴/₆₀ hours and there were only two second stages of over one hour. The puerperium was afebrile in 3 of the sections and febrile in 14. Four of the patients had two sections before the vaginal delivery and in at least one of these the puerperium was febrile. A chart of the puerperia is given.

Type of Puerperium

| | |
|-------|----------------------------|
| 3 | Afebrile |
| 1 | Febrile 3 days |
| 1 | Febrile 5 days |
| 1 | Febrile 6 days |
| 4 | Febrile 7 days |
| 1 | Febrile 8 days |
| 1 | Febrile 14 days |
| 5 | Febrile (length not given) |
| <hr/> | |
| 17 | Total |

As regards the children—there was 1 stillborn in 17 sections and 1 stillborn in 23 subsequent vaginal deliveries. All of the other children were well on discharge.

CONCLUSIONS

1. The dictum "Once a cesarean always a cesarean" is not necessarily true in clinical practice.

2. Each case presents a separate problem and decision should not be made until after a careful study of all the facts at hand. In doubtful cases it need not be made until the second stage of labor.

3. The increasing number of sections being done throughout this country and the tendency to use this operation for nonpelvic reasons makes this problem more important.

4. The condition of scar and type of puerperium, while important, do not necessarily contraindicate a vaginal delivery.

5. Even when the initial section was done for pelvic reason, we are often too ready to do a second section rather than give the patient a chance for a normal type of delivery.

6. The outcome for the baby in normal deliveries following cesarean section for pelvic contraction is good.

7. In 38 cases allowed to go through labor following section, no rupture of the uterus occurred.

I wish to express my appreciation to Dr. J. Whitridge Williams and Dr. Charles H. Peckham for their suggestions and help in compiling these data.

Gragert, O.: Hypernephroma Metastases in the Vagina. Arch. f. Gynäk. 136: 166, 1929.

The author reviews the ten cases which he was able to find in the literature with secondary growths of hypernephromas and adds one case of his own. This patient was fifty-three years of age with a history of a bloody vaginal discharge. Examination showed an ulcerating, pedunculated, dark red mass the size of a hazelnut on the anterior wall of the vagina just below the external urinary meatus. Microscopic examination of this tumor showed it to be an hypernephroma. Several months later the patient was operated upon for an abdominal tumor which proved to be an hypernephroma the size of a man's fist growing from the upper pole of the left kidney. Following its removal the patient made an uneventful recovery.

RALPH A. REIS.

THE USE OF THYMOPHYSIN—A REPORT OF 35 CASES

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AT THE 1929 meeting of the American Association of Obstetricians, Gynecologists, and Abdominal Surgeons, Doctor Nicholas Temesvary of Budapest read a paper entitled, "A Rapid Nonsurgical Procedure for Aiding Childbirth."

Temesvary after a series of experiments with the extracts of the various glands of internal secretion found that of the thymus best suited for the production of rhythmical uterine contractions. The lack of intensity, however, prompted him to combine this extract with pituitrin. He claims that the resulting preparation, known as Thymophysin, materially shortens the duration of labor. This is accomplished by increasing the numerical occurrence as well as the intensity of the contractions without interfering with rhythm or normal physiology.

His report is based on observation of over a thousand cases in which the preparation was employed. He states that the average duration of labor in multiparae is from two to three hours and primiparae from three to five hours. He uses the preparation also in pathologic cases when a rapid labor is desirable, such as premature or artificial rupture of the membranes, primary inertia, elderly primiparae, slightly contracted pelves, marginal placenta previa and toxemias.

Thymophysin has been employed in Europe for several years and there is considerable German literature on the subject. There are but few American reports, however. Haynes of Detroit reported 50 cases in 1928 and Jarcho 18 cases in January of this year. We have been using the preparation since October, 1929, and offer a summary of 35 cases.

The first group includes twelve normal labors in which Thymophysin was used in the first stage (Table I).

Case 1: There was a definite increase in intensity of pains and spontaneous delivery resulted 1 hr. 10 min. later. Case 7: Following the injection, the interval remained the same, but pains were much harder; delivery was completed in 20 min. Case 9: Pains were definitely increased and spontaneous delivery occurred in 55 minutes. Case 10: The action simulated that of unmodified pituitrin. An ampule given after 19 hours of labor produced a tetanic contraction lasting $2\frac{1}{2}$ minutes. Morphine sulphate gr. $\frac{1}{4}$ was necessary for control. Four hours later the cervical dilatation was the same and the pains had become irregular. Injection of $\frac{1}{2}$ ampule of Thymophysin was followed by a contraction lasting 5 minutes. Pains

TABLE I

| NO. | PARA | POSITION | DOSE | IN LABOR BEFORE THYMO. | CERV. DIL. AT TIME OF INJEC. | INTERVAL OF PAINS BEFORE | INTERVAL OF PAINS AFTER | TIME TO COMPLETE DILATATION | SECOND STAGE |
|-----|------|----------|----------------------|------------------------|------------------------------|--------------------------|-------------------------|-----------------------------|---|
| 1 | ii | LOA | 1.1 c.c. | 3½ hr. | 3½ fing. | 6-7 min. | 3-4 min. | 1 hr. | 10 min. Spon. Delivery |
| 7 | ii | ROP | 1.1 c.c. | 7½ hr. | 4½ fing. | 1½ min. | Same | 5 min. | 15 min. Spon. Delivery |
| 9 | ii | ROP | 1.1 c.c. | 5¼ hr. | 3½ fing. | 2-3 min. | 1 min. | 5 min. | 50 min. Spon. Delivery |
| 10 | i | ROP | 1.1 c.c. 0.5 c.c. | 19 hr. 23 hr. | 3 fing. 3 fing. | 5 min. Irreg. | Cont. 1 min. | 18 hr. 14 hr. | 1½ hr. Prophyl. Forceps |
| 14 | iv | ROP | 0.5 c.c. | 8½ hr. | 3½ fing. | 4 min. | 1 min. | 1½ hr. | 20 min. Man. Rotation Low Forceps |
| 17 | iii | LOP | 0.5 c.c. | 5¼ hr. | 3 fing. | 2½ min. | Same | 15 min. | 15 min. Spon. Delivery |
| 19 | iv | LOA | 0.5 c.c. | 7¼ hr. | 2½ fing. | Irreg. | 2 min. | 10 min. | 10 min. Prophyl. Forceps |
| 27 | iv | ROP | 0.25 c.c. | 3¼ hr. | 4 fing. | Irreg. | 3 min. | 45 min. | 10 min. Prophyl. Forceps |
| 30 | v | LOP | 0.25 c.c. | 18 hr. | 5 fing. | 5 min. | 2 min. | 5 min. | 20 min. Spon. Delivery |
| 31 | i | ROP | 0.25 c.c. | 3 days | 5½ fing. | Irreg. | 1 min. | 15 min. | 45 min. Prophyl. Forceps |
| 33 | iii | LOA | m2 | 5 hr. | 2½ fing. | Irreg. | 2 min. | 45 min. | 21 min. Prophyl. Forceps |
| 34 | iii | ROP | m3 | 7¼ hr. | 3¼ fing. | 1 min. | Same | 20 min. | 13 min. Prophyl. Forceps |

again became much harder, but dilatation was not complete until 14 hours later. The delivery was normal. Case 14: There was a definite increase in intensity. Dilatation was completed in 1¼ hours. Delivery was by manual rotation of head and immediate low extraction. Case 17: Spontaneous delivery occurred in 30 minutes—a very nice result. Cases 19 and 27: These cases gave excellent results—irregular pains in each instance were converted into regular contractions and spontaneous deliveries followed promptly. Case 30: A multipara with active pulmonary tuberculosis. The Thymophysin preceded an intravenous injection of 7½ gr. of sodium amytal. Spontaneous delivery followed the production of very hard contractions. Multiple mucous membrane lacerations were observed following delivery. Case 31: This patient had irregular pains for about 3 days—when pains became regular, the cervix was 4 fingers dilated. Thymophysin was administered. A laceration of the mucous membrane of the posterior wall about the size of a half dollar was found by vaginal examination. This tear occurred prior to any manipulation and was undoubtedly due to the pressure of the head caused by the increased intensity of the contractions. Spontaneous rotation of the head occurred and delivery was completed in 1 hour. Case 33: Irregular pains were converted into regular contractions and delivery followed promptly. Case 34: Pains were markedly increased in intensity although the interval remained the same. The membranes were ruptured artificially shortly after the injection. A few minutes later the fetal heart was noted to be quite slow; examination revealed an occult prolapse of the cord. This was replaced. The heart rate increased and the child was delivered by prophylactic forceps.

The second group includes eight cases in which Thymophysin was injected during the second stage (Table II).

TABLE II

| NO. | PARA. | POSITION | DOSE | IN 2ND STAGE BEFORE INJEC. | ANESTHETIC | CONTRACTIONS | TIME TO DELIVER | DELIVERY |
|-----|-------|----------|----------|----------------------------|--------------|--------------|-----------------|------------------------|
| 20 | ii | L.O.A. | .25 c.c. | 10 min. | N_2O-O_2 | + | 20 min. | Spontaneous |
| 21 | i | L.O.A. | .25 c.c. | 2 hr. | N_2O-O_2 | + | 20 min. | Mid-forceps extraction |
| 22 | i | L.O.A. | .25 c.c. | 1½ hr. | N_2O-O_2-E | + | 11 min. | Prophylactic forceps |
| 23 | i | R.O.P. | .25 c.c. | 30 min. | | 3 min. | 1½ hr. | Prophylactic forceps |
| 24 | i | R.O.P. | .25 c.c. | 45 min. | N_2O-O_2-E | + | 24 min. | Low forceps extraction |
| 25 | ii | L.O.A. | .25 c.c. | 10 min. | N_2O-O_2-E | + | 10 min. | Prophylactic forceps |
| 26 | i | R.O.P. | .25 c.c. | 20 min. | N_2O-O_2 | + | 45 min. | Low forceps extraction |
| 32 | ii | L.O.T. | m3 | 5 min. | N_2O-O_2-E | + | 20 min. | Prophylactic forceps |

Case 20: Developed a late secondary inertia. Thymophysin produced regular contractions and spontaneous delivery was effected. Case 21: Likewise developed an inertia after 2 hours of second stage—the contractions converted an expected difficult mid-forceps extraction into an easy delivery. Case 22: A prophylactic forceps delivery was facilitated—the preparation being administered after the patient was under gas-oxygen anesthesia. Case 23: The patient presented an R.O.P. at the spines after she had been in the second stage 30 minutes—pains were irregular. The intensity and regularity of the pains showed a marked improvement after Thymophysin—rotation was spontaneous and there was a good crown in 40 minutes. Following delivery, however, this patient had a moderately severe postpartum hemorrhage. During the 12 hours in first stage she had received only ¼ gr. of morphine, ½₂₀₀ gr. of scopolamine and 1 bottle of ether and oil (Gwathmey). Case 24: A compound presentation—R.O.P. and hand. Intensity of pains was markedly increased—patient was draped for delivery and under gas-oxygen anesthesia when the Thymophysin was given—vaginal examination revealed an occult prolapse of the cord (fetal heart was 80). A living child was delivered by rapid low extraction. Case 25: A marginal placenta previa—membranes were ruptured to control hemorrhage. Administration of Thymophysin preceded a prophylactic forceps delivery. Case 26: Administration with patient under gas-oxygen anesthesia—good contractions produced. The outlet, however, was markedly contracted and delivery effected by a very difficult low forceps extraction. Case 32: Patient was fully dilated on admission and immediately anesthetized. With preparations for delivery completed, she was allowed to come out of the anesthetic—pains were irregular. The Thymophysin brought about regular contractions and the delivery was completed.

The remaining fifteen cases showed various abnormalities (Table III).

Cases 3, 28, 35: These were true primary inertias. The result in the first instance was spectacular. The second case did not prove as successful. Following the first injection the contractions increased, but dilatation was not effected. The

TABLE III

| NO. | PARA. | POSITION | COMPLICATION | DOSE | CONTRAC- TIONS | TIME COMP. DIL. | 2ND STAGE | REMARKS |
|-----|-------|----------|--------------------------------|----------------------------------|-------------------|---------------------------|--|---|
| 3 | i | R.O.P. | Prim. inertia | 1.1 c.c. | + | 35 min. | 1 hr. Proph. for. | 21 hr. labor |
| 28 | i | R.O.P. | Prim. inertia | .25 c.c. .25 c.c. .25 c.c. | + ± + | 19 hr. 3 hr. 1 hr. | Cervix 5½ f. Mid- forceps extraction | 40 hr. labor. Man. dil. and rotation |
| 35 | i | L.O.A. | Prim. inertia Dry labor | m. 3 m. 3 | + + | 4½ hr. 2½ hr. | Cervix 5½ f. Mid- forceps | 76 hr. labor. Cer. in- cised |
| 11 | ii | R.O.P. | Pre-eclampsia | .5 c.c. | + | 3 hr. | 25 min. for. Rot. and low extraction | Rise B.P. 40 points |
| 5 | iii | R.S.P. | Pre-eclampsia Bag insertion | 1.1 c.c. 1.1 c.c. | + + | 2 hr. 3 hr. | Bag expell. Breech ext. | Bag insert. induce labor |
| 15 | ii | L.O.P. | Bag insertion | .5 c.c. .5 c.c. .5 c.c. | Same + + | 24 hr. 20 hr. 4 hr. | Cervix 5½ f. Spont. rot. and low extract. | Bag expell. before Thymo. injection |

other two injections were perhaps a little more satisfactory, but 1 hour after the last, delivery was deemed advisable—there still remained a slight rim of cervical tissue which was dilated manually. Manual rotation of the head was followed by a mid-forceps extraction. The results were likewise unsatisfactory in Case 35. In this instance the membranes ruptured 27 hours after the onset of labor—at which time the cervix was 2 fingers dilated. The dilatation had not changed materially 28 hours after the rupture of membranes, and No. 4 Vorhees' bag was inserted—the bag was expelled in $3\frac{1}{2}$ hours. Thirteen hours later, which was 72 hours after the onset, the cervix was $4\frac{1}{2}$ fingers dilated—the pains were irregular. Thymophysin (m3) was given and the same dose repeated in two hours. The contractions increased after each injection but there was practically no change in cervical dilatation. After the latter medication, the fetal heart rate increased noticeably and meconium appeared mixed with amniotic fluid. In the interest of the child, the cervix was incised anteriorly and posteriorly and a mid-forceps extraction done. Cases 11 and 5: These were pre-eclampsies. In the first instance the contractions were markedly increased in intensity. Morphine was given for control. After $3\frac{1}{2}$ hours, the head was well down, but in a transverse position. Barton forceps were applied and a low extraction accomplished. Following Thymophysin, the blood pressure increased from 160/100 to 200/100. In Case 5: A No. 4 Voorhees' bag was inserted to induce labor. As soon as the pains began, an injection was given; pains became hard and the bag was expelled in 2 hours. The pains then diminished and the Thymophysin was repeated. Conditions were satisfactory for an easy breech extraction 3 hours later. Case 15: A No. 4 bag was expelled 12 hours after insertion. The pains immediately became feeble. Three successive doses of Thymophysin increased the intensity of the contractions, but had little if any effect on the cervical dilatation. Twenty-four hours after the first Thymophysin, the cervix was $5\frac{1}{2}$ fingers, the head had rotated and a low extraction was done.

The final group of cases presented varying degrees of contractions of the pelvis (Table IV).

Cases 2, 6, 8: These were multiparae with histories of difficult deliveries—each presented a male type of pelvis with some degree of contraction and an increase in inclination. In Case 2, the head could barely be reached by rectal examination after a ten-hour test of labor. The slight amount of overlapping of the fetal skull bones justified this test and the use of Thymophysin. A little more than an hour after the injection, the head was low in the pelvis. Barton blades were applied in the transverse diameter, and a fairly easy low extraction accomplished. In 6, the head was at the brim and the cervix undilated. One hour after the injection, it was possible to apply the Barton blades and perform a high extraction. Likewise, in Case 8, the increase in contractions aided dilatation. A myocardial condition of the mother necessitated a high forceps extraction 5 hours later. Cases 4 and 18: These were border-line pelvises and there is little doubt that the Thymophysin was in a large degree responsible for comparatively easy vaginal deliveries—in the latter, prophylactic forceps delivery also was facilitated by Thymophysin in the second stage. Case 12: A breech presentation remained high after 20 hours of labor in a questionable pelvis. Cesarean section was seriously considered, but breech extraction was successfully accomplished following two injections of the preparation. Case 13: This case presented a serious problem in as much as she was seen 2 days after the membranes had ruptured. Labor had been intermittent, but sufficiently prolonged to give a good test. The pelvis was small and the head barely dipping in the brim. Two injections were given and vaginal delivery accomplished. Case 16: This patient received $\frac{1}{2}$ ampule 19 hours after the onset of

TABLE IV

| NO. | PARA. | POSITION | PELVIS | DOSE | CONTRAC- TIONS | TIME TO COMP. DIL. | 2ND STAGE | REMARKS |
|-----|-------|----------|---------------------|--------------------|-------------------|-----------------------|-------------------------------|----------------------------|
| 2 | iii | L.O.T. | Male type | 1.1 c.c. | + | 1½ hr. | Low forceps extrac- tion | Barton forceps |
| 6 | v | R.O.P. | Male type | 1.1 c.c. | + | 54 min. | High forceps extrac- tion | Rapid dilatation |
| 8 | v | R.O.P. | Male type | 1.1 c.c. | + | 5 hr. | High forceps extrac- tion | Cardiac |
| 4 | i | R.O.P. | True conj. 9 cm. | 1.1 c.c. | + | 45 min. | Prophylactic forceps | 12 hr. labor |
| 18 | i | L.O.A. | True conj. 9.5 cm. | .5 c.c. .5 c.c. | +(2nd stage) | 3 hr. | Prophylactic forceps | 19 hr. labor |
| 12 | | R.S.A. | True conj. 10.5 cm. | .5 c.c. .5 c.c. | + | 4 hr. 30 min. | 1 hr. breech extrac- tion | 25 hr. labor |
| 13 | i | L.O.P. | True conj. 9.5 cm. | .5 c.c. .5 c.c. | + | 2½ hr. ½ hr. | 3 hr. prophylactic forceps | Dry labor |
| 16 | i | R.O.P. | Trans. out. 9 cm. | .5 c.c. | + | 3½ hr. | Mid-forceps extrac- tion | Postpartum hemor- rhage |
| 29 | ii | L.O.A. | Trans. out. 9 cm. | .25 c.c. | + | 3 hr. | High forceps extrac- tion | Manual dilatation |

labor. Three hours later the cervix was $5\frac{1}{2}$ fingers dilated; maternal pulse had risen to 130 (she had had 3 hypodermics of scopolamine aggregating $\frac{1}{100}$ gr.). Dilatation was completed and a mid-forceps extraction done. A severe postpartum hemorrhage occurred—uterus and vagina were packed—clysis and transfusion given—pulse reached 160. Recovery was good, however. Case 29: Following $\frac{1}{4}$ of an ampule, contractions became exceedingly severe. Morphine sulphate (gr. $\frac{1}{6}$) failed to control them and a general anesthetic was administered, even gas-oxygen and ether failed to curb them entirely. The cervix became quite rigid and then edematous. Three hours after the Thymophysin injection, a definite contraction ring was noted—the cervix was approximately $4\frac{1}{2}$ fingers dilated. Fetal distress necessitated a manual dilatation and the child was delivered by a high forceps extraction.

ADMINISTRATION

Temesvary feels that Thymophysin is probably most effective when given at the beginning of the first stage. The various authors fail to agree as to efficacy during the second stage. Our results seem to indicate an equal effectiveness in either stage.

The dosage was originally given as 1 ampule (1.1 c.c.), but there is a definite trend toward smaller doses. Lately we have found $\frac{1}{4}$ ampule, or even less (m4-m3) to be a sufficient dose. The preparation may be repeated after one hour if necessary. It is given as a deep intramuscular injection, preferably in the gluteal region.

CERVICAL DAMAGE

With such added intensity as is seen following Thymophysin we must consider the possibility of uterine damage. We are able to report on cervical inspection in eighteen of the cases:

One case was seen immediately after delivery—the patient was a multipara (19). A bilateral laceration—1 inch on each side was seen. There was no hemorrhage. The remaining seventeen observations were made at the six weeks postpartum examinations. Four primiparae (10, 12, 16, and 23) showed no cervical pathology. Three primiparae (21, 24, 26) showed no laceration, but slight erosions. The remaining primiparae (22 and 28) each showed a bilateral slit of $\frac{1}{16}$ of an inch as well as erosions of the anterior and posterior lips. The multiparae were as follows: No. 2, bilateral laceration, $\frac{1}{4}$ inch; No. 6, bilateral laceration, $\frac{1}{2}$ inch; No. 8, bilateral laceration, $\frac{1}{4}$ inch; No. 14 transverse slit and erosion; No. 15, slight subinvolution, bilateral laceration, $\frac{1}{4}$ inch, slight redness; No. 17, slight erosion; No. 25, erosion of anterior and posterior lips; No. 27, laceration, $\frac{1}{16}$ inch, no erosion, slight redness.

From these observations, too few, however, to draw general conclusions, it may be said that the cervical damage is no more extensive or frequent in incidence than where Thymophysin is not used.

GENERAL CONSIDERATIONS

In the majority of cases, we used the preparation in conjunction with combined morphine, scopolamine and rectal ether (Gwathmey) medication for analgesia. The resulting forceful contractions in the second stage made possible oftentimes a spontaneous delivery before the effect of the analgesic drugs had been lost. The type of analgesia in the first stage was in no way interfered with by the use of Thymophysin. In fact, the analgesic action is desirable with the increased intensity of the uterine contractions.

Unfortunately we have no observations of value to report as to blood pressure. In one toxic individual (No. 11) a rise of forty points in the systolic pressure (from 160 to 200) was noted. Jarcho reports a temporary rise followed by a fall. The depressing effect of thymus extract on the blood pressure is held to neutralize any elevation caused by the pituitrin content of the preparation.

In the normal first stage cases, varying degrees of success, as measured by rapid cervical dilatation, were seen in approximately 84 per cent of the cases; in the second stage group expulsion was aided satisfactorily in about 88 per cent; good results were obtained in 73 per cent of the so-called abnormal group. There were no maternal or fetal deaths. One morbidity (No. 23) was due to a mild pyelitis and another individual (No. 31) developed a mild unilateral thrombophlebitis.

COMMENTS

The enthusiastic character of the existing literature and our anticipation of the popular reception of Thymophysin in this country leads us to discuss the disturbing incidents we have occasionally seen following its use.

We wish first to mention four cases (10, 11, 30, and 33) in which the action was quite similar to that of unmodified pituitrin. The contractions were tetanic in character. In another instance (29) the contractions were exceedingly intense. Morphine sulphate gr. $\frac{1}{6}$ had no effect and they were not completely controlled by gas-oxygen-ether anesthesia. This individual developed a contraction ring.

Two of the cases (16 and 23) had postpartum hemorrhages. In neither instance was an excessive amount of narcotic or sedative drug used. We cannot claim that Thymophysin was the causative factor in either of these hemorrhages, but we mention the accidents, especially since we seem to note more than normal bleeding after some of the other cases. This was especially true when the preparation was administered late in labor. The strong contractions had to be controlled at the time of delivery in order to protect the perineum. As a rule, this could be accomplished only by a comparatively deep stage of anesthesia, which sometimes gave us a sluggish uterus to deal with following birth.

In two instances (24 and 34) occult prolapse of the cord was found. This may have been purely coincidental, on the other hand the increase in intensity of the contractions following Thymophysin may have been a factor.

A definite instance of fetal distress was noted in one of the primary inertia cases (35). After the second injection of Thymophysin, which precipitated very strong contractions, there was a discharge of meconium accompanied by a rapidly rising fetal heart rate. Immediate delivery was necessary in the interests of the child and the cervix had to be incised. In another case (29) a rapidly rising fetal heart rate following an injection, necessitated a manual dilatation and a high forceps extraction.

CONCLUSIONS

The comparatively small number of cases in this series does not permit general conclusions. We are convinced, however, that Thymophysin is a very powerful uterine stimulant. We would advise against its use in the dose recommended by Temesvary, since less than one-quarter of that dose in our hands produced violent uterine contractions. Occasionally the drug simulates unmodified pituitrin. Preparations, therefore, should always be made to meet such emergencies as tetany or threatened rupture of the uterus, injury to the lower segment or cervix, and extensive laceration of the soft parts. We feel that, as yet, sufficient study has not been made to warrant general and indiscriminate use of this drug.

103 MEDICAL ARTS BUILDING.

Quin, J. S.: Acute Inversion of the Uterus. Irish Journal of Medical Science, page 115, 1930.

Gangrene and interference with the uterine circulation can occur only when there is a constricting ring of cervix through which the inversion of the uterus has occurred. It is therefore suggested that in any case in which manual replacement at the time of occurrence is either inadvisable on account of the patient's condition or immediately unsuccessful, that this ring should be sought for and, if present, obliterated by entirely completing the inversion by gentle traction. There will be less danger of sepsis in a uterus with a good blood supply.

WM. C. HENSKE.

THE BIOLOGIC DIAGNOSIS OF EARLY PREGNANCY BY THE ASCHHEIM-ZONDEK TEST

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THE diagnosis of early pregnancy has proved of great difficulty to the practitioner of medicine even until the present time. Both to the patient, and especially to the consultant, a positive diagnosis of pregnancy often is of the greatest importance, and heretofore has been a problem that could not be solved until sufficient time had elapsed to allow the diagnosis by definite palpatory findings. If the profession now seems to evidence a certain skepticism toward this new method of determining an early pregnancy, one hardly can be surprised, if we recollect the enthusiasm accorded the diagnostic methods of Abderhalden, Kamnitzer, Dienst and others, which now have been discarded.

The Aschheim-Zondek pregnancy test is only two years old but its excellent results consistently have been confirmed by all who have experimented with it.

After we had familiarized ourselves thoroughly with the technic of this test and had proved to our own satisfaction its absolute reliability in control tests on definitely pregnant, and other women positively not pregnant, and also on men, we began to run tests only in those cases in which the diagnosis was of importance clinically. The series here reported includes instances in which a differential diagnosis was made between normal pregnancy and such conditions as abdominal and pelvic tumors, soft fibroids, missed abortions, death of fetus in utero, ectopic pregnancy, primary and secondary amenorrhea, etc.

We also made use of the test for the purpose of establishing or excluding very early pregnancy in women suffering from serious organic disorders in whom the continuance of a complicating pregnancy was expected to prove serious.

Our technic differed slightly from the original procedure of the German investigators as we used but two white infantile mice instead of five, injecting 0.4 c.c. of the first morning specimen of urine twice daily for three days. This is a slightly larger amount than was originally employed. Urines voided early in the morning had to reach the laboratory before nine o'clock. They were immediately acidified to litmus and placed in the refrigerator. No chemical preservative was added at any time, a fact which might explain our low death rate among the experimental animals. Most of the German experimenters recommend the use of mice weighing between six and eight grams, which they found

to correspond to approximately an age of twenty-one days. Since we bred our mice in our own laboratory under particularly favorable conditions and thus knew exactly their age we observed that the usefulness of the animals for this biologic test was more reliably determined by the age of from twenty-one to twenty-four days than by mere weight. We noticed that in the case of small litters the original weight and weight progress of the individual animals was larger than in large litters, in which at times animals did not reach six grams before they were four weeks old. At that age a mouse is too near natural maturity to be any longer reliable for a test of this sort. Our animals were sacrificed ninety-six hours after the first injection, and ovaries and uterus carefully examined. It is a particularly noteworthy fact that without an exception in every positive test the so-called anterior pituitary reaction two (A. P. R. 2) was demonstrable, i.e., hemorrhagic spots (Blutpunkte) were visible to the naked eye. For further study serial sections were made of many ovaries to ascertain presence or absence of reactions A. P. R. 1 (ripening graafian follicles) and A. P. R. 3 (luteinization).

Up to the time of this report we had made eighty-nine tests for diagnostic purposes with only two failures (2.2 per cent). In one pregnant woman the first test was negative but became positive three weeks later. Another patient seems to be pregnant, but the diagnosis cannot as yet be made positive on palpatory findings. Three tests made on her so far have remained negative, both on macroscopic and microscopic study of the injected mice. Further developments in this case probably will explain this most unusual experience with this test. In no instance did we obtain a positive test in the absence of pregnancy.

We were called upon to make the differential diagnosis between fibroid and pregnancy thirteen times. Clinical observation finally confirmed our biologic diagnosis in every instance. Three cases of ectopic pregnancy gave positive reactions, while three cases of missed abortion were negative. In the cases of amenorrheic women, many of them obese, the test proved particularly useful since it was negative in every case in which the amenorrhea was not due to pregnancy.

A few illustrative cases might be mentioned:

CASE 1.—A thirty-year-old nulliparous woman, married nine years, referred for operation because of diagnosed fibroid. Patient asserted that she was menstruating regularly about every twenty-eight days, the last time a week ago, but that of late the flow had considerably decreased in amount. Examination conveyed the suggestion of palpable fetal parts and made the diagnosis of fibroid very doubtful. Therefore, a test was made, which was positive for pregnancy. Two weeks later the fetal heart tones were heard.

CASE 2.—A twenty-seven-year-old patient gave the history of having menstruated but three times annually since onset of menses at the age of thirteen. Flow always of moderate severity and four days' duration. Since her marriage, five years ago, she has been examined during amenorrheic states at three occasions by reliable

obstetricians and in each instance was told that she was pregnant. At each of these examinations the uterus (?) was supposed to have been palpated abdominally and a serous discharge expressed from the breasts. In each instance the amenorrheic period ended with a normal menstrual flow. Our examination four months after last menstruation showed the vaginal mucosa bluish, cervix softened, and uterus the size of a four months' pregnancy. Breasts were enlarged. Urine test was positive and at present there is no further doubt that the patient is pregnant.

CASE 3.—A twenty-eight-year-old nullipara, married four years. No contraceptives used. Menses irregular, twenty-eight- to thirty-six-day interval, flow lasting only one day. Nephrectomy ten years ago. Thyroidectomy six years ago, basal metabolism at present is minus 28 per cent. Patient under treatment for sterility. On the twenty-eighth day of menstrual cycle patient insisted that a test be made because she somehow felt to be pregnant. The test was positive. Patient delivered exactly 280 days from first day of last menstruation.

CASE 4.—A young primipara was delivered October 6, 1929; at that time she was suffering from a severe toxemia, hypertension, albuminuria, and acidosis. Since delivery her blood pressure had remained persistently above 140/86 and the urine had never become normal. She menstruated for the first time since confinement on January 6, 1930, again on February 2. The March menstruation did not appear at the expected time. Patient using contraceptives under strict instruction did not believe that she could possibly be pregnant. Urine test made on March 17 was positive. Therapeutic abortion immediately performed. Chorionic tissue found in uterus.

Case 1 represents the fairly common dilemma of differential diagnosis between fibroid and pregnancy in the elderly nullipara. In this case the clinical diagnosis of pregnancy was rendered particularly difficult through the presence of seemingly regular slight bloody discharges simulating menstruation.

Case 2 is a good example for a diagnostic difficulty experienced frequently by the gynecologist now reliably and promptly cleared up by means of the Aschheim-Zondek test.

Case 3 is of particular interest in view of the unusual early date at which the pregnancy was diagnosed. As far as we know from literature, this probably represents a unique observation.

Case 4 illustrates well the advantage, under certain conditions, of a diagnosis of very early pregnancy required in the interest of the patient.

We wish to report in this connection, that we have made tests with various commercial products which are supposed to contain the anterior pituitary hormone. Injecting into infantile female mice as much as 6 c.c. of such substances within three days we found in none of them on the fifth day any of the aforementioned three reactions supposedly characteristic for anterior pituitary hormones.

In conclusion we can state that we have confirmed the results obtained by the originators of the test; that we have found the reaction extremely sensitive and reliable; that our failures like those of other experimenters amounted to about 2 per cent, and that the so-called

anterior pituitary extracts marketed in this country do not yield in infantile mice the biologic reactions generally accepted as characteristic for those hormones.

A word will have to be said about our practice of employing only two mice for each test. Using at first four as originally recommended, we reduced the number to three and later to two for two reasons: First, because we always, possibly only by accident, found all four mice exhibited identical reactions, and secondly, because it was difficult, breeding the mice ourselves, to have always four females, not more than twenty-one to twenty-four days old, ready whenever we needed them for a test. We still believe, however, that the chances of error are definitely reduced by utilizing four mice for each test, and for this reason we have of late returned to this practice.

3720 WASHINGTON BOULEVARD.

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THE ASCHHEIM-ZONDEK REACTION IN HYDATIDIFORM MOLE AND MALIGNANT CHORIONEPITHELIOMA

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THE recent discovery of the relationship between the anterior lobe of the hypophysis and the ovary constitutes one of the most important advances within recent years of our knowledge of the physiology of the sex glands. While this discovery is still too recent to have completely clarified the physiology and pathology of the ovary, or to have greatly influenced therapy, it has made at least one practical contribution, i.e., the Aschheim-Zondek test for pregnancy. This has been found to be a highly reliable test for growing fetal elements, and, as E. Novak says, "bids fair to become a valuable adjunct to the diagnosis of early pregnancy." On the basis of our experience with the reaction we wish to point out certain observations which may throw light on an associated feature of epithelial neoplasms of the chorion, namely, luteinization of the ovaries. We also wish to demonstrate the usefulness of the Aschheim-Zondek test as a means of diagnosis and prognosis in hydatidiform mole and malignant chorionepithelioma. The incidence of malignant chorionepithelioma following hydatidiform mole (variously quoted as 5 to 25 per cent) necessitates a guarded prognosis with a period of close observation, if not, as some have con-

tended, immediate hysterectomy. A test making it possible to detect continued chorionic proliferation in an early and operable stage is highly desirable not only because of the greater possibility of permanent cure by earlier diagnosis, but also because it would prevent needless surgery in questionable cases.

The significance of the lutein cysts of the ovary so frequently associated with cases of hydatidiform mole and chorionepithelioma has always been an interesting problem which may find an explanation in the light of our more recent knowledge of the anterior pituitary-ovarian relationship. Follicle development, while usually at a standstill during the course of a normal pregnancy as a result of the apparent inhibitory action of the corpus luteum, often progresses at a rapid rate in cases of mole and chorionepithelioma. Sections of these ovaries show many highly developed follicles which form cysts lined with proliferating epithelium undergoing lutein transformation. The luteinization process involves not only the follicle epithelium but also the stroma and has a precocious origin in the follicles themselves and before the usual stage of corpus luteum formation. The resulting cysts may become very large, Stoeckel reporting a case in which they formed a mechanical obstruction to the expulsion of the mole from the uterus.

There is considerable evidence pointing to hypersecretion of the pituitary as the cause of this condition of the ovaries: (1) Association of the cystic condition with certain tumors involving the anterior lobe of the pituitary (Wagner). (2) Its similarity to the changes produced in the ovaries of pregnant and nonpregnant experimental animals by large doses of anterior pituitary hormone (Aschheim-Zondek Reactions I, II, III). (3) The demonstration by Roessler, Zondek, Otto and ourselves that the amount of anterior lobe hormone secreted in cases of hydatidiform mole and chorionepithelioma is many times greater than during normal pregnancy. (4) The presence in the secretion of the anterior lobe of at least two hormones, one of which (Prolan A) causes follicle development, the other (Prolan B) causing luteinization of the follicle epithelium (Aschheim and Zondek).

Whether this excessive production of anterior lobe hormone is the cause or the result of hydatidiform mole or malignant chorionepithelioma is not absolutely clear. It seems likely, however, that the increased hormone production is a result of the abnormal activity of the chorion. Teel and Zondek, observing pregnant animals following injections of large doses of anterior pituitary substance, though noting intra-uterine fetal death (due, according to Zondek, to hemorrhage in the decidua and premature placental separation) did not mention abnormal proliferation of the chorion. Aschheim, Zondek and others, moreover, are of the opinion that the placenta and its elements not

only serve as a storehouse for this hormone but also play a part in its production.

The endocrine nature of the placenta has long been upheld by Halban, Frank and others on the basis of experimental and clinical evidence which seems to show that it contains and probably produces several hormones, one of these being allied through a common action upon the ovaries of immature mice with that produced by the anterior lobe of the hypophysis. Murata and Adachi in 1927 described corpus luteum formation in rabbits after intravenous injections of emulsions of placenta, hydatidiform mole and chorionepithelioma tissue. They were unaware at that time of the similar effect produced by the anterior lobe of the pituitary and concluded merely that the placenta con-

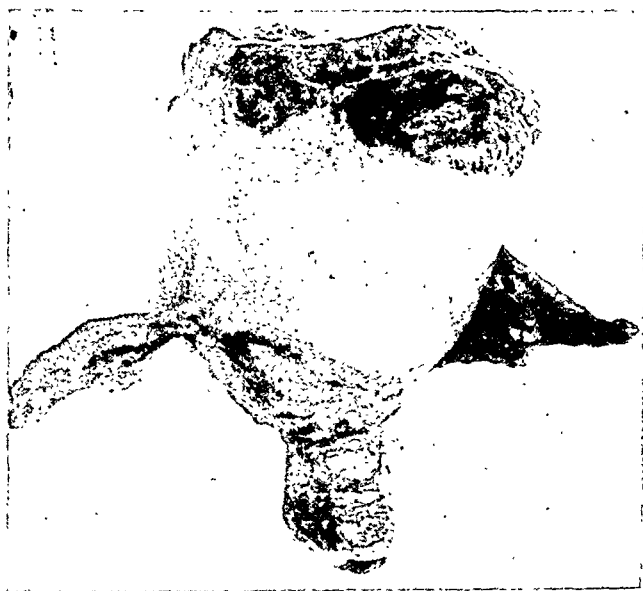


Fig. 1.—Case I. Malignant chorionepithelioma of the uterus.

tained a hormone capable of affecting the ovary. They commented upon the close similarity of their experimental results with the lutein cysts of the ovary occurring in hydatidiform mole and chorionepithelioma. A case of chorionepithelioma involving the fallopian tube reported by de Snoo showed a high concentration in the urine of an estrus-inducing hormone (Menformon). This hormone, similar to or identical with that contained in the ovarian follicular fluid, is quite distinct from that produced by the anterior lobe of the hypophysis and responsible for the Aschheim-Zondek reaction.

But few instances in which the Aschheim-Zondek reaction has been applied to cases of chorionepithelioma have been reported in the literature. To Robert Meyer and his assistant Roessler belong the credit of observing the first positive reaction from the urine of a terminal case

of metastatic chorionepithelioma. The case* has not as yet been reported in detail but has been referred to in the proceedings of the Berlin Obstetrical and Gynecological Society and in numerous writings of Aschheim and Zondek. It was found that the concentration of anterior pituitary hormone in the urine was seven times greater than the concentration usually found in the urine during normal pregnancy, 1/70 c.c. of urine sufficing to provoke a positive reaction. Two terminal cases reported by Otto showed an equally astonishing response. Otto obtained positive reactions not only with 0.3 c.c. doses of urine in a dilution of 1 to 5 but also obtained the same results with fluid extracted from the tumor as well as from small portions of the growth

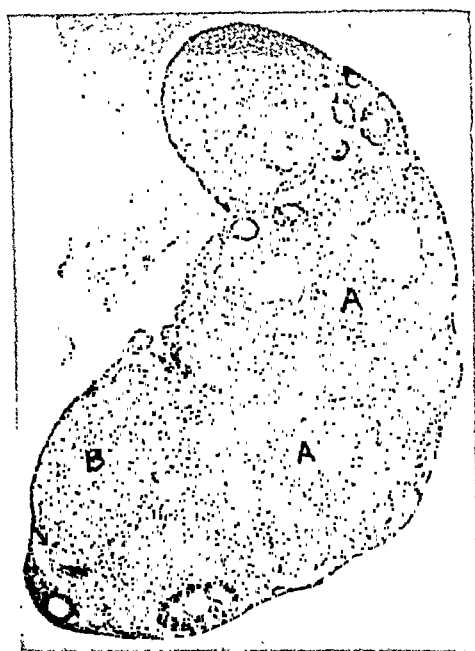


Fig. 2.—Case I. Positive Aschheim-Zondek reaction seven weeks before operation. A, Luteinized follicle with hemorrhage (Reaction II). B, Atretic corpus luteum (Reaction III).

implanted in the thigh musculature of infantile mice. Fels and Schultze-Rhonhof also report positive reactions in cases of chorion-epithelioma.

Zondek describes similar studies in cases of hydatidiform mole. The concentration of anterior pituitary hormone in the urine of these cases being 2 to 3 times greater than in normal pregnancy and that in the fluid of the hydropic villi being greater still. Implantation of mole tissue also gave strong positive reactions. The presence of the hormone in the urine following normal pregnancy can rarely be demon-

*The report of this case as well as of several other cases of chorionepithelioma and hydatidiform mole by Roessler (*Ztschr. f. Geburtsh. u. Gynäk.* 96: 516, 1929) was not available to us at the time this article was prepared for publication.

strated longer than eight days postpartum, while after hydatidiform mole it has been observed for several months. When examinations of the urine have given negative reactions, it is possible to assume cessation of chorionic proliferation.

The cases of chorionepithelioma which we are reporting to supplement those already cited in the literature have been studied by means of the Aschheim-Zondek reaction not only before the primary operation but also for some time afterward. Both patients are living and in the one case repeated negative reactions following hysterectomy and x-ray and colloidal lead therapy have corroborated the clinical findings of apparent health. In the other case the persistence of a strong positive reaction (after the same treatment) antedated the

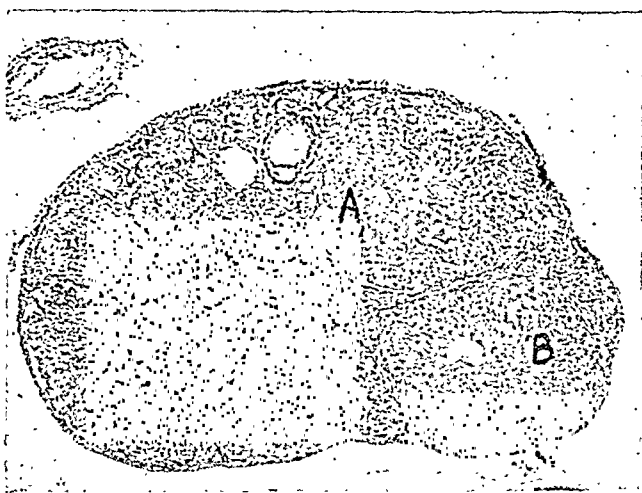


Fig. 3.—Case I. Positive Aschheim-Zondek reaction nine weeks after operation. A. Atretic corpus luteum (Reaction III). B, Atretic corpus luteum with imprisoned ovum (Reaction III).

development of two small metastases in the vagina two months after operation.

One case of hydatidiform mole showed a negative reaction (Reaction I) six weeks after expulsion of the mole, whereas another case has continued to show strong positive reactions for three months after delivery and curettage. A second curettage, performed ten weeks after expulsion of the mole because of prolonged uterine hemorrhage associated with subinvolution of the uterus, showed a well-developed decidua, hydropic villi and isolated chorionic cells in the endometrium. There was no evidence of chorionepithelioma. Examinations of the urine of this patient have continued to give positive reactions. The patient will be kept under close observation until a negative reaction rules out the possibility of a latent chorionepithelioma.*

*Urine examinations continued to give strong positive reactions for six months after expulsion of the mole. In June, the patient became pregnant and aborted spontaneously six weeks later. Further studies have not been made.

Examinations of the urines of our cases when positive showed a high concentration of anterior pituitary hormone, positive reactions being obtained in dilutions as high as 1 to 10 after six injections of 0.3 c.c. each in chorionepithelioma, and in a dilution of 1 to 5 in one case of mole.

A tumor extract prepared from Case 1 gave positive reactions in a dilution of 1 to 12. The extract was prepared by covering several large pieces of tumor tissue with physiologic saline and allowing this to stand in the refrigerator for several weeks. The fluid was then filtered and injected into infantile mice in 0.3 c.c. doses in various dilutions. Minute implants of tumor tissue also gave strong positive reactions after one hundred hours.



Fig. 4.—Case II. Early chorionepithelioma of uterus (after curettage). Lutein cysts of ovaries.

CASE 1.—This very unusual case deserves special mention because of a history of nine previous mole pregnancies, the present one terminating in chorionepithelioma. Similar case reports are rare. De Lee cites an instance of ten, Mayer one of eleven, and Essen-Moeller one of eighteen successive mole pregnancies. Le Maire and Hermont reported instances of six occurring in close succession.

Our case is of interest also for the reason that it appears to support the theory that the cause of these abnormal gestations lies in some inherent defect of the patient, probably in the ovary. This patient although married twice has never had a normal pregnancy, eight mole pregnancies occurring during her first and two during her second marriage.

Mrs. B., aged thirty-seven, was first seen in the Harper Hospital Out-Patient Department Nov. 15, 1929, with a history of amenorrhea since June 15, 1929. The marital history with regard to pregnancies was as follows:

First Husband: First pregnancy 17 years ago, miscarriage 4 mo., hydatidiform mole. Second pregnancy 16 years ago, miscarriage 5 mo., hydatidiform mole. Third pregnancy 15 years ago, miscarriage, 8 mb., hydatidiform mole. Fourth pregnancy 14 years ago, miscarriage 5 mo., hydatidiform mole. Fifth pregnancy 13 years ago, miscarriage approximately 6 mo., hydatidiform mole. Sixth pregnancy 11 years ago, miscarriage 5 mo., hydatidiform mole. Seventh pregnancy 10 years ago, miscarriage 5 mo., hydatidiform mole. Eighth pregnancy 9 years ago, miscarriage 8 mo., hydatidiform mole.

Second Husband: Ninth pregnancy 6 years ago, miscarriage 6 mo., hydatidiform mole. Tenth pregnancy present illness.

Her ninth pregnancy was associated with hypentension, albuminuria, and a transient paralysis of the tongue. The mole was removed by vaginal hysterotomy at Johns Hopkins Hospital, Baltimore.

Her examination on the date of admission to the Out-Patient Department showed a blood pressure of 134/70, the urine showing a trace of albumin and glucose. The uterus was enlarged to the size of a four months' pregnancy.

Aschheim-Zondek reaction *positive*.

Dec. 31, 1929. Blood pressure 154/78. The uterus had not increased in size. The patient was advised to enter the hospital because of a slight amount of vaginal bleeding.

Jan. 8, 1930. A diagnosis of hydatidiform mole was made. Hysterectomy was advised because of the history of repeated mole pregnancies. Panhysterectomy



Fig. 5.—Case II. Positive Aschheim-Zondek reaction three days before operation. A, Luteinized follicles (Reaction II). B, Ripening follicle (Reaction I).

was performed, removing entire uterus and both adnexa. Uterus shows typical chorionepithelioma. (See Fig. 1.) There was no evidence of visceral metastases.

Pathologic diagnosis: "Malignant chorionepithelioma with extensive invasion of uterine wall."—P. F. Morse, M.D.

Jan. 7, 8, 19, 1930. Aschheim-Zondek reaction *positive*.

Jan. 23, 1930. Patient discharged in good condition after x-ray and colloidal lead therapy. Uneventful convalescence.

Feb. 17, 1930. Aschheim-Zondek reaction *positive*.

March 4, 1930. Surgical removal of two small metastases in the anterior vaginal wall. Fifty mg. radium implanted in surgical field for eight hours after operation.

March 7-13, 1930. Deep x-ray therapy. Discharged in good condition.

March 9, 1930. Aschheim-Zondek reaction *negative*. (Reaction I.)

March 15, 1930. Aschheim-Zondek reaction *positive*.

Further studies could not be made since the patient left the city and could not be traced. We assume that she has not been permanently cured.

CASE 2.—Mrs. D., aged thirty, entered Harper Hospital as a patient of Dr. Geo. Kamperman, Dec. 3, 1929, because of profuse uterine bleeding which had begun six weeks previously when she was about four months pregnant. Her last menstrual period was July 18, 1929. Clots of blood and pieces of brown tissue were expelled from the vagina before admission to the hospital. Curettage was performed on the diagnosis of incomplete abortion.

Examination: Essentially negative. The cervix was widely dilated and what appeared to be placental tissue protruded from the external os. A large amount of tissue was removed by curettage. There was no further bleeding.

Pathologic Diagnosis: "Chorionepithelioma malignum."—P. F. Morse, M.D. Subsequent examination of the remaining tissue removed by curettage revealed hydropic placental villi, pointing to hydatidiform mole as the origin of the chorionepithelioma.



Fig. 6.—Case II. Negative Aschheim-Zondek reaction three months after operation. A, Ripening follicles (Reaction I).

Dec. 7, 8, 1929. Aschheim-Zondek reaction *positive*.

Dec. 10, 1929. Panhysterectomy performed removing both adnexa and entire uterus. There was no evidence of visceral metastases. (See Fig. 2.)

Dec. 27, 1929. Aschheim-Zondek reaction *positive*.

Jan. 3, 1930. Intravenous injection of colloidal lead followed by deep x-ray therapy. Discharged after uneventful convalescence.

Jan. 2, 1930. Aschheim-Zondek reaction *negative*. (Reaction I.)

March 4, 9, 1930. Aschheim-Zondek reaction *negative*. (Reaction I.)

CONCLUSIONS

1. The amount of anterior pituitary hormone excreted in cases of hydatidiform mole and malignant chorionepithelioma is greater than that excreted during normal pregnancy.

2. The anterior pituitary hormone is an etiologic factor in the formation of lutein cysts of the ovary.

3. The Aschheim-Zondek reaction is an important diagnostic and prognostic aid in cases of hydatidiform mole and malignant chorion-epithelioma.

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HARPER HOSPITAL.

MUSIC IN THE OPERATING ROOM

By JOHN A. MCGLINN, M.D., PHILADELPHIA, PA.

WHILE the discovery of ether and chloroform anesthesia revolutionized surgery, they have never been entirely satisfactory anesthetic agents. Chloroform, on account of its dangers, is now seldom used, even in obstetrics. Ether, while a relatively safe anesthetic, is objectionable on account of the distress incident to its induction, the postoperative nausea, vomiting, headache and pulmonary irritation. Many methods to avoid the distress of induction have been tried but none have been entirely satisfactory. The preanesthesia dose of morphine and scopolamine, with gas induction, and the modern methods of administration have lessened the terrors of ether but have not entirely eliminated them. Again ether is not a satisfactory anesthetic for the operator in operations about the head and face, chest and abdomen. The failure to obtain complete relaxation of the abdominal muscles and quiet intestines makes what should be an easy abdominal operation, in many cases, a difficult one.

It is not strange in working under the disadvantages of ether and chloroform anesthesia that operators, from time to time, took up with avidity some newly proposed form of anesthesia. We have witnessed the advent and passing of many methods. Some were of such inherent value as to remain in more or less general use. Some, while of undoubted value, were, technically, so difficult of correct application as to make them impracticable.

*Read at the Fifty-fifth Annual Meeting of the American Gynecological Society, held in Hot Springs, Va., May 19 to 22, 1930.

We recall the great impetus spinal anesthesia received from Jennesco's visit and how quickly it was condemned as its dangers were realized. Instead of being an anesthetic of choice it soon became the method of special indications. A few operators, particularly W. Wayne Babcock, persisted in its use, improving the technic until in their hands it became a relatively safe anesthetic. Recently others have taken up the work of the pioneers and, as the result of the work of Pitkin, Labat and others, spinal anesthesia has become so popularized as to put all other forms of anesthesia in the background. Improved technic and anesthetic agents have undoubtedly lessened its dangers but not eliminated them. We use it routinely in all abdominal operations, except for uncomplicated appendicitis, and in all combined plastic and abdominal sections. It hardly seems proper, to me, to risk spinal anesthesia for an operation to remove an appendix which can be done in a comparatively few minutes under gas, ethylene or local anesthesia. Nor do I think it wise to use it in ordinary plastic operations where relaxation is not required and which can be done safely and expeditiously under other forms of anesthesia.

In our clinics we are enthusiastic advocates of spinal anesthesia. No other type of anesthesia gives the relaxation, exposure and quiet intestines in abdominal operations. Operations which are difficult under inhalation anesthesia become easy of execution. The time of operation is shortened, the intestines and peritoneum are less handled and traumatized. The condition of the patient after operation is striking compared to the postoperative distress of the average ether patient. Seldom do gas pains, ileus, nausea, cough or headache distress the patient. To work with it and to see the comfort of the patient after operation is bound to make one an enthusiastic advocate. The picture, however, is not as flawless as painted. There are disadvantages yet to overcome in its administration and it is still more dangerous than ether. I am satisfied that, when our enthusiasm has waned and we are in a state of mind to become judicial, spinal anesthesia will fall from its present high estate and again become the agent of special indications, with the field of indications greatly broadened. Since the first of the year we have had the following experiences that have somewhat tempered our enthusiasm. Two patients received preliminary injections of morphine and scopolamine one hour prior to operation, one a hysterectomy for fibroid tumor of the uterus, the other for old pelvic inflammatory disease. The site of the injection was anesthetized with novocaine 1-200 to which was added ephedrin and neocain in one case, and novocaine in the other, dissolved in withdrawn spinal fluid and reinjected into the spinal canal. Operations were completed without difficulty and with no complications. The patients left the table in excellent condition and remained so for ten

hours when they suddenly became pulseless and it was impossible to record a blood pressure. Peripheral circulation entirely disappeared and the patients were in desperate condition for forty-eight hours, until circulation was reestablished. Whether the condition was due to spinal anesthesia or the late effects of ephedrin, I do not know. Opinions on this point differed with my colleagues who came to my aid in caring for these patients. Two deaths, one in the hands of my first assistant, the other with my colleague, have occurred under exactly similar circumstances. In both the operations, combined plastic and sections lasting nearly an hour, when the effects of the anesthetic wore off it was necessary to give nitrous oxide to complete the operations. After a few inhalations of nitrous oxide and oxygen, death resulted suddenly. What caused death in these two cases I do not know, but spinal anesthesia must bear the larger share of suspicion.

In addition to its inherent dangers spinal anesthesia in common with local anesthesia has the disadvantage of the patient's being conscious and cognizant of what is happening. This statement is, I know, only relatively correct because it is possible with the use of morphine and scopolamine, avertin or sodium amytal to either obtund the senses or even induce deep sleep. There are several objections to these agents. We have had frequent experiences with wild delirium following the second injection of morphine and scopolamine so that it was impossible to give spinal anesthesia and it was necessary to resort to gas and ether sequence. We have had the same experience with amytal. Secondly, we consider it a dangerous practice to have the patient unconscious during spinal anesthesia. If any of these agents are given in sufficient dosage to induce unconsciousness a dosage can be so graded as to make it unnecessary to give any other anesthetic agent. At one time I was quite enthusiastic and reported a large number of operations done under morphine and scopolamine.

It was for the reasons of unpleasant reactions from drugs and the fear of complete loss of consciousness when using spinal anesthesia that led me to look for some method that would obviate these objections and allay the fears of the conscious patient. Anything which would appeal to the senses sufficiently to keep the minds of the patients occupied would divert, from them, the thought of operation. Music best fulfilled the requirements. It did not in any way interfere with the rigid operating room technic and its motif could be changed to suit the taste of the patient. Again we were not dealing with an unknown experience. Music has been used from untold ages during operations and childbirth, not to scare away the devils, but to divert the mind of the sufferer from torments of fear and pain. Many operators in modern times have and do use music in the operating rooms. Donald Guthrie, of Sayre, has music played preliminary to and

subsequent to ethylene anesthesia. A number of hospitals have added the radio to their operating-room equipment to be used as an adjuvant to local anesthesia in tonsil operations on children.

We have been using music for a year and have been well satisfied with the results and feel that it is a valuable addition to the operating room.

There is a growing tendency to consider the psychology of the patient's fear of all that relates to the hospital. As a result the newer hospitals are planned to eliminate the hospital atmosphere and stress the apartment or hotel atmosphere. This idea is well carried out from the time the patient enters the front door until she reaches the operating suite. It is true that the sensibilities are somewhat deadened by a preliminary injection of a sedative, but they are still acute enough to be thoroughly aware of the nature of the surroundings. The one place that hospitals have neglected to modernize is the operating room. The patient on reaching the operating suite feasts her eyes on the surgeons and assistants parading garbed as for a barbecue, while they listen to the jingle of the instruments and basins, the hiss of escaping steam, and the cries of a child fighting his anesthetic. I know that these conditions do distress patients and, in many cases, cause such a panic of fear as to affect the patient for months after she has left the hospital.

When we first started using music we thought of it only in connection with local and spinal anesthesia. We now recognize its value in:

A. Creating a better atmosphere for all patients coming to the operating suite. Patients are greeted with music and the usual noises of the operating room are not heard. (In addition we have adopted the custom of wearing a linen coat over the operating suit and discarding masks and caps while actually outside the operating room.)

B. Diverting the attention of patients in operations under local and spinal anesthesia.

C. Relaxing the tension of the operator and operating room personnel during operations.

D. Entertaining the operating suite force during the arduous tasks of cleaning up, and preparations, after the work of the day is finished.

It is hardly necessary to discuss A. It is self-evident that any agent which will allay the fear and often terror of the patient on coming to the operating room and will make the minutes which seem like hours, while awaiting operation, pleasant instead of a nightmare of horrors, is of great value. Music does this.

B. We now give one dose of morphine and scopolamine thirty minutes before the scheduled time for operation. We rarely see any ill

effects from scopolamine by this practice, but the patients are fully conscious and aware of what is occurring. The spinal injections are made painless by the preliminary injection into the skin and ligament of 1-200 novocaine. We have had a few patients, in a fairly large series, object to the music. These were of the highly hysteric type and who were not really suited to spinal anesthesia. The majority of patients enjoy the music and it is not an unusual experience to hear them humming a familiar tune. I have heard a patient singing loudly while a forceps extraction was being done. There is no question that the patients are better for the lack of psychic shock and lessened pre-anesthetic drugging.

C. The first case in our experience was one of those densely adherent old inflammatory cases that ruins the surgeon's reputation for equanimity of disposition. In this case, as is usual in cases of this character, everything went wrong: gloves tore, catgut broke, knives and scissors were dull, forceps would spring, but strange to relate the assistants were fine boys and the nurses were angels. This relaxation of tension was to me a remarkable demonstration of the old saying that "music hath charms to soothe the savage beast." The reaction to music must be individual but it has made my operating room a pleasanter place to work for myself and those who work with me.

D. The idea of music to entertain and to lighten the burden of work is not new. The reader in the tobacco factories in Cuba is an old and familiar sight. The boats of the Mississippi have been laden to the crooning of negro melodies and the great transcontinental railways were built to the tune of "Drill, ye tarriers, drill." Many large manufacturing plants where the labor is monotonous in character now use music to divert the mind of the worker from the task in hand. The nurse in charge of the operating room tells me that the nurses are happier in their tasks, and that the work is speeded up and more work is accomplished with less tiring, with the music, than prior to its use.

It soon became evident that there must be at command a constant source of the kind of music wanted. This ruled out the radio. We also found that for practical purposes a continuous source of music must be available. It would not be practicable to assign a nurse to change records. Good production is also essential. To supply these requirements a special self-playing automatic record-changing instrument with a superior type of reproducer* has been constructed.

The next and most interesting problem was to find the type of music suitable. We nearly wrecked the study in its incipency by trying to adapt the type of music to the character of the individual. The first few patients were of the dancing, flapper type and we soon found that, while they like jazz at the roadhouse, it had no place in the

*The Victor Talking Machine Company has developed and constructed this instrument.

operating room. Sentimental music must also be avoided. We found that soft, soothing melodious music is the kind most acceptable to all patients.

When we first introduced music to the operating room we were the victim of a good deal of good-natured and, at times, acid raillery, but many who joked are now enthusiastic as to its value.

There is nothing new or revolutionary in the idea here presented. It is but another step forward in the modern thought that all medical and surgical procedures be shorn of physical and mental suffering.

1900 RITTENHOUSE SQUARE.

(For discussion, see p. 727.)

THE IMPORTANCE OF UROLOGIC INVESTIGATIONS IN GYNECOLOGIC PATIENTS*†

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MOST patients who consent to an elective gynecologic operation or submit to palliative measures directed to the female organs have a right to expect that such measures will either relieve or cure the symptoms for which these procedures are advised. Over a period of years, we have been impressed more and more by the number of patients reaching our hands, either at the clinic or in private practice, with symptoms persisting after operation or after prolonged therapy. These observations led us to carry out the investigations we herewith outline. In the cases in which operative procedures had been resorted to, the desired anatomic result was obtained in most instances. The end-results of plastic operations on the perineum, for cystocele, and for uterine prolapse were beyond criticism. In a number of cases, however, various organs had been sacrificed. The symptoms of which these patients complained were those familiar to the gynecologist: sacral or lumbar backache, urinary disturbances, suprapubic discomfort, pelvic dragging, lower abdominal distension, etc.

Because of the close association of the urinary tract with the female pelvic organs, we deemed it advisable to make a detailed urologic study of every patient who presented herself with such symptoms persisting after operation or after palliative treatment, such as vaginal packings, douches, diathermy, foreign protein injections, etc. Most of the patients had been discharged from other institutions as cured, and were so recorded. Although many of the operative results were entirely satisfactory from the corrective standpoint, they were one hundred

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†Read before the Harlem Medical Association, March 25, 1930.

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per cent failures so far as symptomatic relief was concerned. On Dr. Dannreuther's service a preoperative study of the urinary tract is carried out on practically all candidates for elective operations.

In this series, 169 patients were studied. Some of these had been admitted to the gynecologic clinic and then referred to the female cystoscopic clinic; others came under observation in private practice. Those admitted to the gynecologic dispensary had a careful history taken and were then subjected to a complete pelvic examination. This included every available diagnostic aid to insure a correct diagnosis. On its completion, the patient was referred to us for a urologic investigation. The female cystoscopic clinic is an integral unit of the gynecologic service, and an atmosphere of hearty cooperation prevails at all times.

Our investigation included the following details:

1. Inspection of the external genitals, with special attention directed to evidence of skenitis, urethral caruncle, prolapse of the urethra, cystocele, and uterine prolapse.

2. Notation of relaxation of the vesical sphincter, manifested by the dribbling of urine on coughing, straining, or exertion.

3. Macroscopic inspection and microscopic study of catheterized specimen of urine.

4. Cystoscopic investigation, with particular attention to its capacity, tolerance, contour, mucosa, urethro-vesical junction, trigone, and ureteric orifices.

5. Indigo carmine test for renal function.

6. Ureteral catheterizations, doing each side at a separate sitting.

7. Culture of the urine specimen from each kidney.

8. Pyclogram, ureterogram, or cystogram, as indicated.

We have not been satisfied to explain urinary frequency on the basis of a cystocele alone. We have not felt that a retroversion of the uterus, with the cervix displaced anteriorly under the pubic arch, completely explains a patient's bladder disturbance. In several such cases, seen by us after a corrective operation, the patients experienced the same annoyances that existed before operation, and it was only after a complete urologic investigation and the discovery of pathology in the urinary tract that the true etiologic factors were revealed.

Of the 169 cases, 59 had been operated upon previously for:

| | |
|--------------|----|
| Appendix | 12 |
| Gall bladder | 7 |
| Uterus | 13 |
| Tubes | 7 |
| Ovaries | 6 |
| Pelvic floor | 5 |
| Cystocele | 9 |

Our study also included 81 cases on Dr. Dannreuther's service at the Post-Graduate Hospital in which an elective operation on the female pelvic organs had been recommended. In this group, 29 had been treated elsewhere previously without relief. The patients found to have definite lesions of the urinary tract requiring surgical attention, were referred to the urologic department. It is interesting to note that 12 had both pelvic and urogenital pathology. Some of our patients had suffered as long as 15 years with the same symptoms, only to be relieved after the institution of treatment directed to the urinary organs. Negative cases were sent back to the gynecologic clinic for advice and treatment. Of those patients who had definite pathology in the urinary tract, 6 had stones in the kidney or renal pelvis; 1 had a huge stone in each kidney; 4 had pyonephrosis; 3 hydronephrosis; 5 renal ptosis; 29 pyelitis or pyelonephritis; 6 ureteral dilatation; 7 ureteral stricture; 1 a double ureter with stricture; 1 a diverticulum of the bladder; 3 intravesical newgrowths; 2 foreign bodies in the bladder; 12 ureteral caruncle; 3 prolapse of the urethra, and 2 had urethral stricture.

A few case reports illustrating the object of this paper might be of interest:

CASE 1.—Mrs. F. K., 31 years of age, came complaining of dull pain in the back along the right side; she also had dull pain in both lower abdominal quadrants, aggravated by exertion, on the right side. She had been suffering from this condition for about two years. Her right tube and ovary, as well as the appendix, had been removed one and one-half years before with no relief of symptoms. Cystoscopic examination revealed the following: bladder capacity normal; mucous membrane moderately congested; the right ureteral orifice congested and dilated; function sluggish. The left ureteral orifice was fairly normal. Trigone was edematous, cystic, and hemorrhagic. The vesical neck presented nothing abnormal. Our impression at this time was that we were dealing with a chronic cystitis cystica and, from the appearance of the right ureteric orifice, we felt there was pathology above. The right ureter was subsequently catheterized and a markedly turbid specimen obtained with abundance of shreds, flakes, and debris. Microscopically, there was an abundance of pus. The indigo carmine test showed that the dye was eliminated from the left side in 12 minutes, and the right side in 14 minutes. The right ureter was again catheterized about a week later and about 60 c.c. of urine was drained in a very short time, suggesting a hydronephrosis. The patient was next subjected to a pyelographic study of both kidneys and ureters, this investigation being done separately on each side after an interval of 3 days. The x-ray report showed the left kidney to be normal in shape, size, and position. The right kidney was enlarged and a contrast substance in the right renal pelvis showed a marked dilatation and blunting of the minor calyces. The x-ray diagnosis was marked dilatation of the right kidney pelvis with probable pyelitis. Her right renal pelvis was lavaged 6 or 7 times at intervals of 5 days. The indigo carmine test after 2 months showed a healthy elimination of the dye in 6½ minutes from the right side, and in 3 minutes from the left.

CASE 2.—Mrs. R. B., 36 years of age, was referred to us for pain in the left groin radiating to the left ovary. She had been suffering from this for several months and was treated medically and gynecologically without relief. Upon cystoscopic examination we found the following: capacity normal, as well as tolerance

and contour; the mucosa generally reddened and thickened, with several scattered hemorrhagic areas. The right ureteric orifice was markedly congested, elongated and dilated, the left ureteric orifice embedded in a mass of hyperplastic tissue and cystic nodules. The findings around the left orifice were highly suggestive of pathology higher up. The trigone was edematous and covered with a mucous film. The neck was negative. The left ureteric orifice was catheterized and obstruction met about 3 inches from the vesical orifice. The indigo carmine test showed a good elimination from both sides in two minutes. A pyelogram was done subsequently with an x-ray catheter in the left ureter; the catheter was found to be in contact with an oval-shaped dense deposit opposite the ischial spine on the left side. This deposit appeared to be a low ureteral calculus. The contrast substance was then injected and showed a fusion of a contrast medium obliterating the calculus. The upper ureter was slightly tortuous in its course and somewhat dilated. There was rather marked dilatation of the kidney pelvis on the left side. On close examination of the x-ray film, on the right side several small granular deposits were found in the central region of the right kidney, evidently calculi. Our diagnosis in this case was oval-shaped calculus in lower part of left ureter with dilatation of the left kidney pelvis, as well as several small calculi in the right kidney.

CASE 3.—Mrs. M. C., 42 years of age, complained of sharp recurrent pains in the right loin and lower abdomen for one year. She also experienced sharp pains on voiding, as well as nocturnal and diurnal frequency. She had had appendix, and right tube and ovary removed 8 years prior to this. Gynecologic examination was negative except for a cystic cervix. Cystoscopic examination gave the following findings: capacity and contour normal; the mucosa markedly hyperemic; distinct double opening on the right side of the bladder which appeared as a double ureter; the superior opening was smaller than the inferior. A No. 5 catheter passed easily into both ureters and cloudy urine was obtained from both. Indigo carmine test showed elimination of the dye from the left ureter in 15 minutes, and from both openings on the right side in 11 minutes. A pyeloureterogram was done with catheters introduced into both ureteral openings on the right side. Examination was also made with contrast injection of the right side, and showed a double ureter with a small pelvis and somewhat blunted calyces in the upper pole and a rather large kidney pelvis with three main calyces in the central and lower area; the left kidney was of normal shape, size, and position. The patient had both ureteral openings catheterized at 5 to 7 day intervals as well as 5 per cent neosilvol instillations to the kidney pelvis and took pyridium, 2 tablets three times a day by mouth. She responded very promptly to this treatment and was cleared of her infection after two months. Our final diagnosis was: double ureter and rudimentary superior pelvis with large normal pelvis on the right side; as well as chronic pyelitis.

CASE 4.—Mrs. M. J., 28 years of age, presented herself to the gynecologic clinic suffering from frequency of urination, and sharp recurrent pains in the right loin. For the past 4 years she had had periodic attacks of pain in the left loin, which radiated along the course of the left ureter. She had had a previous appendectomy and also a left tube and ovary removed. She was examined once by a physician during an attack of pain in the left loin and he made a clinical diagnosis then of renal calculus. Following an attack 6 months ago the patient had a pyelogram done at a hospital in Jersey and the x-ray report was negative. A few months later another pyelogram was done at another hospital in Jersey also with negative findings. She finally came to the Post-Graduate O.P.D. gynecologic clinic, where a gynecologic survey was made and the report showed no pathology. She was then referred to the female cystoscopic clinic where a routine bladder and kidney exam-

ination was done. The left ureter was catheterized and a purulent specimen was obtained which contained numerous small granular flakes and débris suggesting a chronic pyelitis. She was promptly treated for this condition, and was greatly improved both symptomatically and otherwise after a few weeks.

CASE 5.—Mrs. H. P., 25 years of age, consulted us for sharp pains in the left lower abdomen, which she had for about 2 years. Gynecologic examination was negative. Cystoscopic examination revealed a generally hyperemic bladder. The left ureteral orifice was congested and function was good. The right ureteral orifice showed moderate inflammation, was dilated, elevated, elongated, and the function was poor. An indigo carmine test showed elimination of the dye from the right ureter in 15 minutes, and from the left in 5 minutes. A pyelogram showed the kidneys of normal shape, size, and position. A spherical shadow of somewhat irregular structure measuring over a quarter of an inch in diameter, was seen in the central pelvic region of the right kidney; the contrast substance injected showed a moderate pelvic dilatation with an S-shaped twist at the uretero-pelvic junction. A culture of the urine yielded a pure culture of bacillus coli on the right side. Final diagnosis: calculus of the right renal pelvis with infection.

CASE 6.—Miss M. W., 17 years of age, complained of sharp pains on voiding for over 10 months; she also had sharp recurrent pains in the back and over lower abdomen. She was a virgin and had refused pelvic examination both at our hospital and elsewhere. Upon cystoscopic examination there was found a distinct obstruction at the vesical neck, and when a Furniss metallic catheter was passed to fill the bladder, a distinct stone-like click was experienced. With a Nitze examining cystoscope a large spherical-shaped stone, grayish white in color, was seen obstructing the greater part of the vesical neck. A cystogram showed a large oval-shaped calculus about 2½ inches long in the bladder with a large hairpin embedded therein. Patient was operated at the Post-Graduate Hospital, and stone and hairpin removed by Dr. Clarence G. Bandler. Final diagnosis: large calculus of the bladder with a foreign body embedded in the calculus (hairpin). This patient, prior to our first seeing her, had been treated medically as well as by physiotherapeutic measures without relief.

CONCLUSIONS

Many patients with gynecologic symptoms often suffer from pathologic conditions of the female urinary tract.

Failure to examine the urinary organs often results in a needless sacrifice of such organs as the gall bladder, appendix, fallopian tubes, ovaries, or uterus.

The indigo carmine function test is a helpful adjunct in preoperative examination of gynecologic patients. It gives a quick and approximate idea of the surgical competence of the kidney and so helps to prevent the development of postoperative, unrecognized uremia.

All gynecologic patients should be cystoscoped before any elective gynecologic operation is done.

801 WEST END AVENUE.

CYSTITIS EMPHYSEMATOSA*

V. A CASE IN A WOMAN IN WHICH TRAUMA APPEARED TO BE AN ETIOLOGIC FACTOR

BY RALPH G. MILLS, M.D., FOND DU LAC, WIS.

TRAUMA has entered into the history of several of the cases previously reported. The patient in Case 2 was repeatedly examined with a cystoscope, and a tumor of the bladder was fulgurated. Ureteral catheterization was performed in Case 4, and several cystoscopic examinations were made. An hypertrophied prostate gland had been removed from the patient in Case 8 one year before, and a catheter was used shortly before his death. In Case 6 there was an area of hemorrhage in which vesicles occurred. The area was similar to that shown in Fig. 1 of this article. At the time Case 6 was reported the full significance of this area was not appreciated. This patient was catheterized six days before her death, at which time 1100 c.c. of urine was withdrawn. The condition of cord bladder was probably relieved by the catheter several times before her death ensued. A catheter was employed within six days of death in Cases 3, 5, 10, and 12 (the case reported here). In Case 11 catheterization was ordered six days before death, but it is not recorded that it was carried out. In the remaining cases, Cases 1, 7, and 9, there is no record of catheterization, but it probably was done because of the comatose condition of the patients.

The clinical and hospital records in each case were studied to discover evidence as to whether a catheter had been used during the patient's illness. This was found to be unsatisfactory, as note was frequently not made of this procedure. Care given as a routine in hospitals differs slightly, but in general a patient is not allowed to exceed eight hours without voiding or having the catheter used. The nurse's notes frequently did not state the manner in which a given specimen of urine had been obtained. Fortunately in the case reported here, Case 12 of the series, the records had been more carefully kept, and presented evidence that was conclusive.

CASE 12.—A woman, aged seventy-six years, registered at The Mayo Clinic the last time, December 28, 1928. She had been at the clinic on several previous occasions, the first time in 1913. At this time she had been suffering with urethral caruncle and a chronically irritable bladder. Cystoscopic examination had been made, and the mucosa of the bladder had been found to be markedly inflamed.

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The patient returned April 16, 1927, and was operated upon for chronic cholecystitis and cholelithiasis; the gall bladder and common bile duct were opened for the removal of a stone in each. A year later, acute pains began in the upper portion of the right quadrant of the abdomen, lasting for two days. Two weeks before the last admission these pains returned, associated with chills, fever, vomiting, and later, jaundice.

During the examination, rigidity of the abdomen and a palpable mass in the upper portion of the right quadrant of the abdomen were demonstrated. The serum contained bilirubin to the extent of 10 mg. in 100 c.c.; the van den Bergh reaction was direct. The concentration of blood urea was found to be 68 mg. and creatinine 3.4 mg. in each 100 c.c. The urine was purulent.



Fig. 1.—Gross appearance of the bladder. The drawing was made from a photograph taken of the fresh specimen, and corresponds with a description written at the same time that the photograph was made.

January 2, 1929, cholecystotomy was again performed and the gall bladder, which was distended with 300 c.c. of brownish fluid mixed with pus, was emptied. Two small stones were found. Owing to the presence of acute infection, and the high concentration of blood urea, it was not considered advisable to open the common bile duct.

During the postoperative period of three days, the concentration of blood urea rose to 181 mg. in each 100 c.c., and signs of bronchopneumonia developed. The bladder was catheterized the day after operation. The amount of urine withdrawn was 400 c.c., the reaction was acid, and the specific gravity was 1.010; the urine contained albumin graded 2, granular casts graded 2, and pus graded 3, with about 30 pus cells in a low-power field. The following day the amount of the catheterized specimen was 475 c.c., the reaction was alkaline, and there were about 18 pus cells

in a field. On previous occasions, in voided specimens, a few erythrocytes were discovered. Glucose solution, 20 per cent, was given intravenously on several occasions. Death occurred early the next morning.

Necropsy was performed three hours after death on the unembalmed body. Two small stones were found in the common bile duct producing obstruction and jaundice. Local suppurative pylephlebitis, bronchopneumonia, bilateral ureteropyelitis and cystitis emphysematosa also were found.

The mucosa of the bladder was slightly yellow and was markedly hyperemic. Grossly the mucosa was normal in structure except at two places (Fig. 1). These were on the posterior wall about 5 cm. from the urethral opening; one was directly opposite the orifice, and the other about 1 cm. to the right. Both were about 1 to 1.5 cm. in diameter. The one in the middle was slightly more hemorrhagic than the one on the right. The former contained a group of rather large, gas-

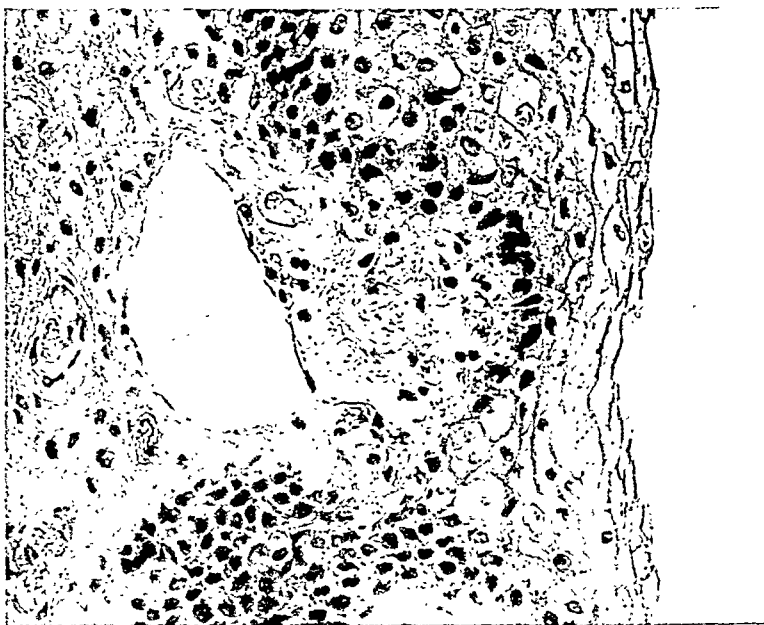


Fig. 2.—A lymphatic vessel, distended with gas, lying just below the surface of the bladder which is still covered by an intact layer of epithelium. Between the two is a mass of bacteria, which apparently has not invaded the lymphatic vessel. $\times 300$.

filled vesicles in the submucosa, varying in size from 2 to 3 mm. There were about twelve of these vesicles. The area on the right side contained about half that number, each of which was slightly smaller than those in the middle area. The wall of the bladder was somewhat thickened in these regions, corresponding to the amount of projection of the lesions into the lumen. Other portions of the bladder appeared to be normal.

The microscopic appearance of the structures in this case conforms in general to the description of the changes in the bladder in Cases 7, 8, 9, and 10, which have been reported previously. The details given here will, therefore, deal chiefly with the features of special interest wherein elucidation of moot points has been facilitated. The epithelial layer was lost over the lesions, but was relatively unaffected at the edges, where there was no evidence of inflammation. The spread

of organisms into this area is shown in Fig. 2, in which a mass of bacteria lies beneath the intact epithelium. A lymphatic vessel, distended with gas, lies immediately beneath it. Bacteria were not observed in the lymphatic system. Inflammatory reaction was noted near the center of the lesions (Fig. 3); the leucocytic infiltration was below the surface rather than involving the lining membrane of the lumen. Distribution of the cellular collections was irregular; some portions were heavily infiltrated, whereas others were entirely free. This patchy distribution is shown in Fig. 4, in which the collections lie about a lymphatic vessel. In the center of the figure, also, is shown a lymphatic vessel filled with coagulated material in which a few leuco-

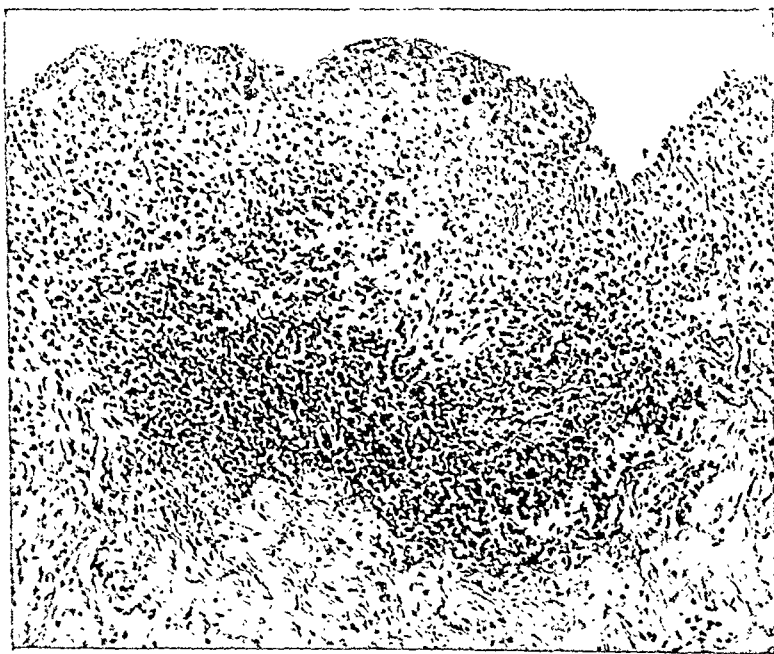


Fig. 3.—A focus of inflammatory tissue lying a little below the surface of the bladder (above). The intervening structures show very little change. The epithelium has been lost. $\times 175$.

cytes appear. No actual injury was discovered in this lymphatic vessel, in spite of the abundant perivascular infiltration. In another section, however (Fig. 5), a hyalin mural thrombus was found in a lymphatic vessel. This was not associated with localized infiltration or with other evidence of inflammation in the region.

The lymphatic channels in other portions of the lesions, in addition to the one shown in Fig. 2, suffered by distention (Fig. 6). The former endothelial lining of the lymphatic vessels has degenerated, as shown by the dark-colored masses that line the spaces. These chromatine masses have been observed before, but their relation to the lymphatic vessels was never so clearly demonstrated. Giant cells have been said to arise from degenerated endothelial cells, but I found no

evidence in this case to support the contention. Individual nuclei cannot be distinguished, and the chromatine seems to be undergoing dissolution.

The blood vessels in these sections were affected both by acute and by chronic types of injury. The latter are probably sufficiently explained by the advanced age of the patient. Fresh thrombi occasionally were seen, more or less obstructing the flow of blood. In a few areas of chronic inflammation, evidences of obliterative endarteritis and organized thrombi were observed. Hemorrhage entered prominently into the picture, as presented grossly (Fig. 1), and as observed microscopically in many sections. In Fig. 7 is shown a vesicle contain-

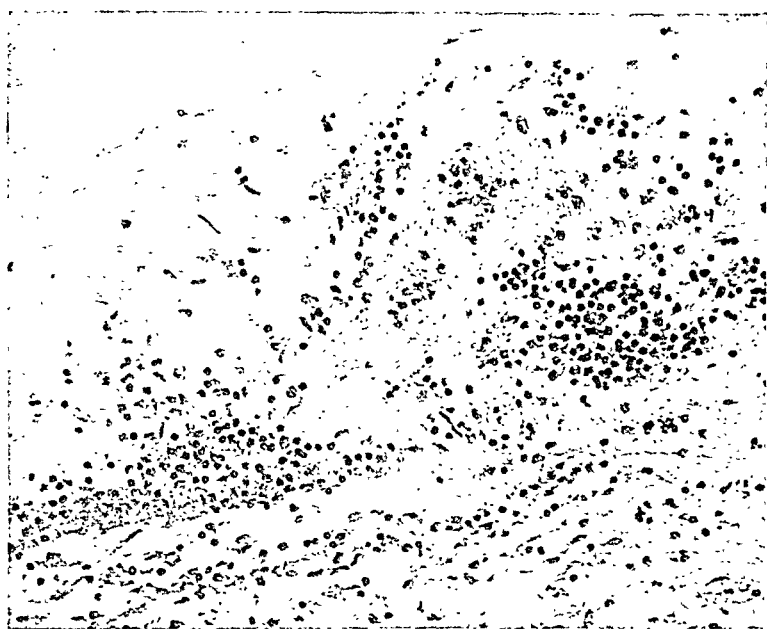


Fig. 4.—A distended lymphatic vessel lying near the surface of the bladder (above) and a vesicle just below the limits of the photograph. The lymphatic vessel contains coagulated lymph, in which are a few leucocytes. It follows a devious course, and there is cellular infiltration about it. $\times 225$.

ing clotted blood; the clot is broken up by gas bubbles. Layers of fibrin appear on the walls lining the cavity, suggesting the intermittent character of the bleeding. Most of the vesicles were perfectly clear and were filled only with gas.

COMMENT

It had been suspected, in the study of reported cases, that the element of trauma might have been significant in the induction of cystitis emphysematosa. Cystoscopic examination and the manipulations involved in ureteral catheterization were thought of sufficient moment to produce minute, or possibly more gross, injury to the mucosa of the bladder. In one instance a small papilloma within the bladder had

been removed by fulguration. It is conceivable, also, that other forms of injury, such as the passage of a stone, over-distention, exploration of the bladder during laparotomy, or possibly transmitted injury through falls or blows, might also be potent forms of injury. These would all be relatively rare as etiologic factors, whereas catheterization is commonly performed, and usually is considered a harmless procedure.⁶ In this case, the peculiar situation and appearance of the lesions created an impression that the catheter had been responsible for the initiation of the disease. This was thought to be more than a hypothesis when in the history was found the record that catheterization had been done on two successive days immediately preceding the death of the patient.

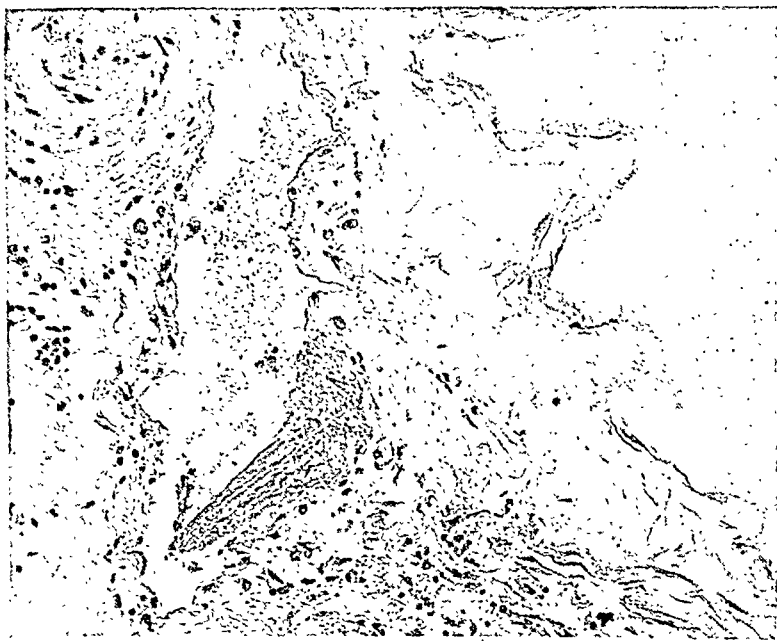


Fig. 5.—A large lymphatic vessel parallels the wall of a vesicle, which is the open space on the right side. On its wall has formed a hyalin thrombus that does not include cellular elements within it, and they are also absent in the adjacent tissues. Edema is prominent in this region. $\times 175$.

The gross appearance, as well as details determined in microscopic sections, showed that the middle lesion was undoubtedly older than the one a little to one side. This would correspond with the history of catheterization on two successive days. The appearance of the two lesions, with a presumed interval of a day between, would strongly suggest the rapidity with which vesicles may form in a given place. However, a comparison of the area involved in this case, with those illustrated in other reports, suggests that for the disease to spread over the entire organ would require several days at least. If this reasoning is sound, the inference is justifiable that although cystitis emphysem-

atosa may develop during the last days of life, at least it is an *intra vitam* process, and not a *postmortem* phenomenon. How long before death it may develop, or whether it may occur in a relatively healthy person, remains to be demonstrated.

The mere passage of a catheter into a bladder, even if the tip should impinge on the opposite wall, does not of itself produce cystitis *emphysematosa*. If it did, cases in which this lesion develops would be common instead of relatively rare. The presumption is that conditions of some sort must be right to permit a trivial injury to the mucosa to initiate the lesion. Presumably this would include the presence of a certain type or types of bacteria, possibly with lowered local resistance.



Fig. 6.—The endothelial lining of a large lymphatic vessel undergoing early degeneration. The nuclei in these deeply staining masses are indistinguishable, but there is little doubt as to their identity. It is doubtful if such cells could give rise to giant cells by nuclear division. $\times 150$.

Bacteria undoubtedly enter the bladder much more frequently than is commonly appreciated. Bacteria have been found repeatedly in the urethra of both males and females far above the meatus, and the introduction of any instrument, the catheter included, tends to carry them farther up the urinary tract. Baisch found that in women who were confined to bed, and were allowed to urinate only twice in twenty-four hours, *Escherichia coli* could be cultivated from the urethra within five days. The multiplication of urethral bacteria was inhibited by increasing the frequency of urination and the total quantity of urine. It is reasonable to suppose, then, that if a patient, especially a woman, were confined to bed, and perhaps in a serious physical condition, her

bladder would be more exposed to the invasion by vaginal and urethral bacteria than if the patient were able to walk about. Jansen observed that cystitis was less frequent among patients who got out of bed early, than among those who were longer confined. All of the patients whose records have been detailed have been in such serious condition during the last few days of their lives as possibly to predispose them to the development of this form of disease of the bladder.

Very few efforts have been made to determine the extent of injury to the bladder produced by catheterization. Kolischer found a "mild desquamative catarrh" frequently, especially about the trigone and ureteral openings. He saw no evidence that the actual passage of a

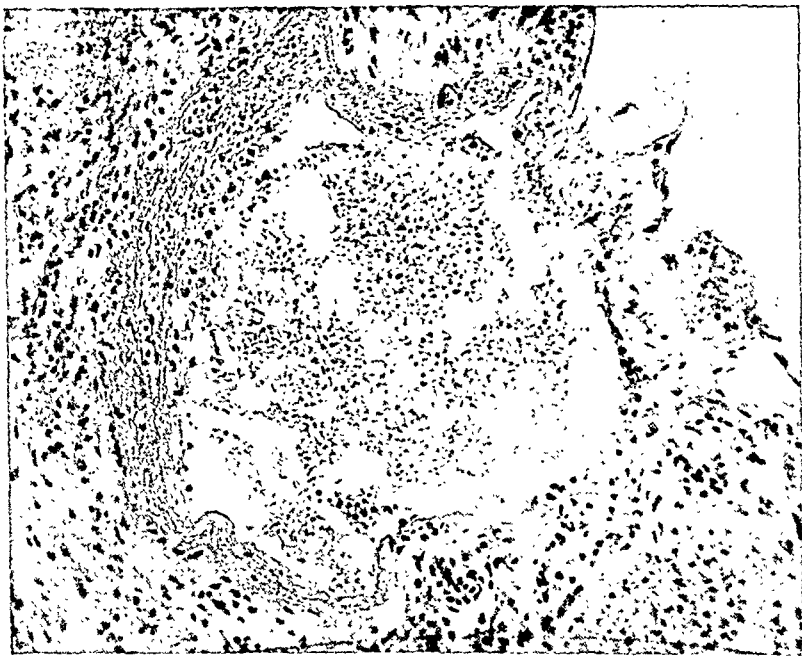


Fig. 7.—A vesicle lying near the surface, partly filled with blood. This has coagulated, producing a lamellated clot attached to the walls, and leaving free blood in the center. The latter has been split up by bubbles of gas. $\times 150$.

catheter had injured the mucosa of the bladder, either at the vesical orifice or on the opposite side, where the tip might impinge. Kolischer further asserted that, with the exception of the *Neisseria gonorrhoeae* and the *Corynebacterium diphtheriae*, the various pathogenic bacteria do not produce cystitis unless the wall of the bladder has been injured previously. This may vary all the way from mild desquamative catarrh to traumatic cystitis or actual necrosis. This statement might or might not apply to organisms capable of producing cystitis emphysematosa.

In the case reported here, there could have been only a minimal amount of injury to the wall of the bladder, as the urine obtained by the second catheterization did not contain blood, and none was observed in the small quantity obtained at necropsy. Such a minute

lesion, then, would surely be overlooked during cystoscopic examination, such as was carried out by Kolischer. If such trauma as that seen in this case is of operative origin, it is not because of the degree of injury to the mucosa, but because bacteria already present are permitted to invade the tissues. Nor would it be reasonable to assert that a catheter alone would produce this minute lesion. Multiple hemorrhages in the submucosa have been observed in cases of chronic distention, and especially in acute distention, after decompression had been performed. These were more noticeable when the decompression had been accomplished rapidly than when the urine had been withdrawn slowly. Hemorrhages in the mucosa of the bladder frequently are seen at necropsy in cases in which there has been no distention of the bladder. Possibly one may believe that any factor capable of producing hemorrhage in the wall of the bladder would be sufficiently potent to encourage bacteria already present to invade the tissues.

In the control of bacteria and their multiplication in the bladder other factors may be operating than those mentioned. Hain, for example, was able to influence the development of bacteria in the urine of a dog by modifications of the diet. Residual urine, left in the bladder after voiding, or after catheterization, has been recognized as important in potential or actual infections of the urinary tract.^{2, 11} The inability of the bladder completely to empty itself leaves urine behind capable of perpetuating the growth of bacteria already present, or of providing a culture medium for any that might be introduced during instrumentation. The free use of the catheter associated with lavage of the bladder and complete drainage, is perhaps the reason for the relative immunity from cystitis noted by urologists following examinations and treatments. Cystitis is relatively common in bedridden patients, with disease situated in other parts of the body, and in whom complete drainage of the bladder is not assured. Lavage and drainage may also explain the apparent freedom from the results of slight or even of more extensive injury to the mucosa of the bladder and urethra.

The presence of residual urine indicates some disease in the wall of the bladder, or interference with the nerves that control it, which amounts to the same thing in the end. Cystitis, causing residual urine to remain behind after micturition, may develop in a bedridden patient, and when the disease is acute and the sensorium dulled it may not give rise to symptoms of which the patient would complain. It is possible also for the bladder to be the seat of serious resistance-reducing disease whereas the other organs remain in relatively good condition. In such a state, a degree of injury that is unable normally to allow invasion of bacteria into the wall of the bladder might be enough to initiate the infection. It remains to be demonstrated, however, whether

the ordinary invading organisms of the urinary tract are capable of producing the lesion, or whether some special organisms must be present.

In the case reported, the history of an urethral caruncle and of a chronically irritable bladder at the time of the first visit to the clinic, together with cystoscopic examination and the report of an inflamed mucosa, indicates that for at least fifteen years there may have been local disease of at least moderate severity. Pus in the urine at the time of the last examination indicates either that the cystitis had not disappeared or that it had recurred. The histologic evidences of chronic inflammation confirm the history of long-continued cystitis, but those in the lesion under consideration were, for the most part, of recent origin. During this period it is conceivable that the walls of the bladder had weakened, permitting residual urine to collect. Thus the local condition was apparently favorable for acute exacerbation when a trifling injury to the mucosa was produced.

Examination of an early lesion such as this has been more enlightening than a similar study of those more advanced. It has shown an early stage in the degeneration of the lymphatics of the region, and obstructive phenomena in the blood vessels as well. Giant cells were not observed, although they have been present in all of the cases studied previously. This suggests that they are associated with a later stage of development. Eosinophils were just as abundant as in the other cases, and pigment was found here and there through the tissues; evidently there had been hemorrhage before the present lesion began. Lymphatic vessels, when they were observed, were distended with gas, and in a relatively unchanged condition, unless the hyalin thrombus is of significance. Proliferative lymphangitis, or that associated with infection of the ordinary sorts, was not observed. That gas forming in one place may well be transported to more distant points through the lymphatics is strongly suggested by the figures reproduced. How rapidly this could take place, and how soon a considerable area of the wall of the bladder could be inflated by this means is still uncertain.

SUMMARY

Another case of cystitis emphysematosa is reported, with clinical and pathologic details. This case represents a very early lesion, which probably was initiated by the slight trauma produced by a catheter abrading the mucosa of the bladder. There are two lesions, one older than the other, corresponding to catheterization on two successive days, the latter on the day preceding death. The injuries must have been trivial and did not cause the loss of an appreciable amount of blood, as the control specimens of urine were free from erythrocytes. Perhaps any form of injury to the mucosa, whether by a catheter, instrument or spontaneous hemorrhage, may initiate the lesion if other conditions be fulfilled.

Cystitis appears to be necessary as a background on which cystitis emphysematosa may develop. Evidence is accumulating that the lesion results from some form of infection.

The lymphatics are capable of transporting the gas to a certain extent beyond the point of its production. They are at first distended and then degenerate. There is no evidence that giant cells arise by multiplication of the cells of their endothelial lining.

It is now certain that cystitis emphysematosa develops during life, and is not a postmortem phenomenon. Lowered resistance, at least of the bladder, seems to be necessary for its development, but whether this condition is limited to the last few days of life of a patient practically moribund, or whether it may occur in a patient with only serious disease of the bladder, has not been determined.

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Beckmann describes two forms of hyperplasia of the uterine mucosa. One form which Adler describes as "hypertrophy" is dependent upon the ovulation cycle and shows a regular progression through all the stages of hypertrophy. This form is accompanied by profuse and protracted menstrual bleeding. The second type has all the functional stages of hypertrophy present in the uterine mucous membrane at one and the same time and is not always accompanied by menstrual disturbances. This type the author calls "hyperplasia endometrii glandularis cystica."

RALPH A. REIS.

Case Reports

REPORT OF A CASE OF FIBROMYOMA OF THE UTERUS WEIGHING 133 POUNDS REMOVED AT OPERATION

BY MOSES BEHREND, A.M., M.D., PHILADELPHIA, PA.

AT THE present time it is most unusual to encounter abdominal tumors of great size. Last year before the Pathological Society of Philadelphia I reported the successful removal of an ovarian cyst weighing 33 pounds. It was thought then that the limit in size had been reached until this patient presented herself for operation. Larger and heavier tumors have been reported than the case under consideration. The reader is referred to Gould and Pyle's book on *Anomalies and Curiosities in Medicine*.

Before operation a diagnosis of ovarian cyst was made. During the operation it was also thought that we were dealing with a huge cyst of the ovary. In certain areas thin walls were noted which contained fluid, while in other areas, solid masses could be felt throughout the tumor mass. After the examination by the pathologist it was decided that this particular neoplasm originally arose from uterine tissue because the tumor was attached to the uterus, and part of the fundus of the uterus had to be sacrificed in its final removal. The pedicle was rather short and fixed.

A. R., age thirty-five years, admitted to the Mt. Sinai Hospital March 2, 1930. The chief complaint was an enormous swelling of the abdomen. About nine years ago patient was seized with sharp abdominal pain in conjunction with her menstrual period. About that time she first noticed a small swelling in her lower abdomen which has become progressively larger. The patient was walking about and working as a druggist up to six weeks ago, when following a nervous breakdown due to business reverses she was advised to rest in bed. She is usually very thirsty, dyspneic, appetite good, and bowels regular. She has no urinary symptoms. Menstruation began at thirteen, was regular, no excessive bleeding. No pain associated with menstruation. She has menstruated about three times in the past three years, last period about ten months ago. Even in the presence of the tumor she considered that she enjoyed good health, except that in the past six weeks she has felt quite weak. She has never been pregnant. Blood pressure 104/58. She was a white, poorly nourished female adult sitting in bed, complaining of thirst, breathing with slight difficulty, with an enormously distended abdomen. On account of the size of the abdomen the edematous legs are sharply abducted and cannot be adducted unless the tumor is raised with the assistance of two persons. The contour of the chest is rendered insignificant as a result of the huge abdomen. The heart action is regular, and the organ is displaced to the left. The abdomen is enlarged to a sphere whose circumference is 5 feet 8 inches. The skin is enormously stretched from the epigastric region to the apex of the swelling. The umbilicus is at a point opposite the epigastric region. The skin of the abdomen is edematous. Upon palpation there are felt areas of fluctuation and other areas of solidity on the lateral aspects of the mass. The mass is painless. Urea nitrogen 13. Blood sugar 0.115. Wassermann weakly positive, Type III. Gruskin test negative. Urine showed no albumin or sugar. Hemoglobin 33, R. B. C. 2,170,000, W. B. C. 6700, polymorphonuclear 88, S. M. 7, L. M. 1, TR. 2, eosinophiles 1. Myelocytes-Polychrom, Anesopoikilocytes present.

Operation.—The patient was operated upon in bed after having been transported to the operating room. This was deemed better than placing her on the operating table because it required eight men to put her from the stretcher to her bed when admitted to the hospital. The incision was begun without anesthetic on account of the anesthesia produced by the pressure of the tumor. A small incision was first made and about two gallons of fluid was released. The incision was then enlarged until the hand could circumnavigate the circumference of the tumor. It was found to be fairly free and movable. The incision was then enlarged to about 14 inches when the tumor was delivered. The thinned-out great omentum covered the tumor for a considerable distance. This was freed. Posteriorly the parietal peritoneum was closely adherent to the tumor; this was incised and sponges used to wipe away the adherent peritoneum. After the tumor was free the pedicle was then clamped, incised, and the growth removed. Immediately after operation the tumor weighed



Fig. 1.—The patient before operation. Note the huge size of the tumor. She is unable to bring the legs together in adduction unless the tumor is raised. Circumference of the abdomen measured 5 feet 8 inches.

133 pounds. The tumor was not aspirated because there were too many solid areas in the tumor. Except for a slight alteration in the pulse the patient passed through the immediate effects of the operation in good condition. The patient received 300 c.c. of blood and reacted well. She passed 50 ounces of urine the first day and 42 ounces of urine the second day. The pulse was good but on the second day signs of pneumonia were elicited, from which she finally died.

Autopsy.—(By Dr. I. Davidsohn, pathologist to the hospital.) The face is very emaciated and pale. The abdomen is pendulous. There is an operative incision in the mid-line along the entire abdomen. The skin of the abdomen and the lower extremities is edematous. The operative incision is extended to the upper end of the abdomen. The diaphragm reaches to the fourth rib on both the left and right sides.

Heart: weighs 310 gm. and measures 9.5 x 10 cm. The pericardial sac contains 85 c.c. of a clear, straw-colored fluid. The left ventricular wall measures 18 to 22

mm. The right ventricular wall measures 8 mm. The cavity of the left ventricle is distinctly enlarged. There is some dilatation of the right ventricle. The auricles and valves present no abnormalities. The mitral ostium measures 9 cm. The aortic ostium measures 6.5 cm. The pulmonary ostium measures 6.5 cm. The tricuspid ostium measures 11 cm. The coronary arteries present no abnormalities. The ascending aorta shows a few areas with distinct longitudinal striations. These changes are suggestive of a syphilitic aortitis.

Left lung weighs 510 gm. There are a few old adhesions. The lung is heavier than normal. The lower lobe shows no abnormalities. The pleura of the upper lobe shows a thin fibrinous exudate. The lobe shows a consolidation involving its posterior two-thirds. On the cut surface the picture is that of complete consolidation. Right lung weighs 280 gm. It shows a few dense adhesions; otherwise there are no abnormalities.



Fig. 2.—Photograph of tumor taken immediately after operation.

Spleen weighs 824 gm. It is very much enlarged. The consistency is very firm. The cut surface shows a very marked follicular hyperplasia.

Liver weighs 2940 gm., and it is considerably enlarged. The surface shows a few yellow spots about the size of rice grains. They are indistinctly demarcated. Similar spots are present on the cut surface which shows an indistinct lobular structure. Gall bladder and pancreas showed no abnormalities.

Left kidney is rather large, weighing 210 gm. The capsule strips with ease. The cortical structure is indistinct, showing an acute clouding swelling. The kidney pelvis is somewhat dilated. Right kidney weighs 220 gm. It shows the same changes as the left, except that the dilation of the pelvis is more marked. Left ureter is slightly dilated but patent. Right ureter is markedly dilated but patent. Adrenals are swollen and edematous.

Peritoneal cavity contains 4096 c.c. of a thin hemorrhagic fluid. Stomach mucous membrane is somewhat thickened and congested; otherwise there are no abnormalities.

Only the lower end of the uterus is present. The fundus has been removed. Right ovary enlarged to about the size of a chicken's egg. It is soft and fluctuating. The cut surface contains a cyst about the size of a walnut, filled with a thick soft material like chocolate. Left parametrium is only partly present and it is closed with many operative sutures. All the pelvic tissues are very edematous. The retroperitoneal space is occupied by large clumps of varicose veins and enlarged glands. The veins on the cut surface are found filled with thrombi.

The tumor measures 60 x 29 x 58 cm. It is formed by the coalescence of four irregularly round bodies, which are more or less accurately demarcated from each other by thick, constricting bands. Scattered throughout the mass are small solid and cystic tumors varying in size from a cherry to an orange. The whole mass is definitely encapsulated by a glistening, smooth membrane through which can be seen a variety of colors from white and pink to red brown and black and contains many dilated blood vessels. The pedicle of the whole tumor is a short stump measuring 7 x 3 x 1½ cm., running off the groove which separated the largest mass from the others. The tumor is of varying consistences, some portions definitely cystic and fluctuating and others definitely solid. Different parts of the mass show degrees of softness in a wide range between these two.

Numerous sections from various parts of the tumor showed a typical structure of fibromyoma. Very pronounced edema is frequent in many places. In others hyaline degeneration is seen. The veins are distended with blood. A marked inflammatory reaction evidenced by round cell infiltration and plasma cells is found in various parts of the tumor. There is no evidence of ovarian tissue. A diagnosis of fibromyoma is made.

Such tumors originate most frequently from the uterus, but they do occasionally arise from the ovary. The left ovary could not be traced, neither during the operation nor in the subsequent examination of the specimen. An attempt to discover it at autopsy was also unsuccessful. The uterus was rather small and the tumor did not appear to be in direct connection with it. It is however quite possible to assume that the fibromyoma originated from the uterus and during its further growth became separated from it and connected through a pedicle. Eventually when it grew to its monstrous size, that connection through the pedicle might have become indistinct as the pedicle was pushed away by the growing tumor.

1738 PINE STREET.

PLACENTA INCRETA

BY BORIS KWARTIN, M.D., AND NATHAN H. ADLER, M.D., F.A.C.S.,
BROOKLYN, N. Y.*

(From the Departments of Laboratories and of Obstetrics, Beth Moses Hospital)

INTRODUCTION

PLACENTA accreta and increta are among the most serious and, from a prognostic standpoint, among the gravest complications of the afterbirth period. Klawns,¹ in 1928, collected 45 cases, including five which were observed in the Vienna Clinic from 1900 until 1927. Joachimovitz,² in 1929, rounded this number out to 70. Since then we were able to find two more cases in the literature. Klostermann³ reported a case of placenta increta with a uterine rupture. No etiologic factors could be made responsible. Sussig⁴ described a placenta accreta with pregnancy in a uterine diverticle. Dr. Goldzieher in the United Israel Zion Hospital, Brooklyn, N. Y., and Dr. Stöhr in the Woman's Hospital, New York City, each showed to one of us a case of placenta accreta.

The rapid increase in the number of reported cases within the last few years would indicate that this condition is not as rare as one is forced to conclude from the various reports in the literature. Polak and Phelan⁵ reported one in 6,000; Klawns found one in 14,000; and Nathanson⁶ observed approximately 1 case of true placenta accreta in 20,000 deliveries.

We feel that many cases of true placenta accreta are not recognized. The severity of this condition and the importance of its early recognition merit a short discussion, especially since the symptoms and the physical signs in many instances are suggestive and should receive more attention in order to make possible the correct diagnosis.

A case of unusual interest, on account of its symptomatology and antecedent history, came under our observation.

CASE REPORT

Mrs. M. B., gravida ii, para i, twenty-eight years old, was admitted on January 29, 1930, to our obstetric service for cesarean section two weeks before term, on account of a previous cesarean section and symptoms of threatening rupture. In December, 1926, the patient—a primipara—was admitted to our obstetric service at term. She was in labor for 40 hours with membranes ruptured for 12 hours, a persistent unrotated right occiput posterior presentation and floating head. The pelvic measurements showed a moderately generally contracted pelvis. A low two-flap cesarean section was performed and a normal child and placenta delivered. The postoperative course was rather stormy. The patient ran a temperature between

*Read before the New York Pathological Society, New York Academy of Medicine, May 22, 1930.

99° and 102° with signs of bronchopneumonia, severe cough and moist râles all over chest. She also had a severe wound infection involving all layers of the abdominal wall. The patient finally recovered and was discharged after a stay of 6 weeks in the hospital. She was well throughout the intervening period and also throughout the second pregnancy up to admission to the hospital. On examination, the uterus was found to be irregularly enlarged, of an hour-glass appearance. The patient complained of indefinite lower abdominal cramps for the last week and had slight dark bloody vaginal discharge for the last 24 hours. On account of these symptoms it was decided not to wait till term and proceed at once with the operation. The patient's condition before operation was satisfactory. Blood pressure, temperature, pulse and respiration were normal. Urinary and blood findings were negative. Under spinal anesthesia, a low classical cesarean section was performed. An hour-glass uterus with the omentum adherent to the entire anterior surface of the uterus and to the abdominal wall was found. The scar of the previous operation was noted in the lower uterine segment. This portion of the uterus was intact,



Fig. 1.—Placenta increta. Ingrowth of chorionic villi into the musculature. Absence of decidual elements. (X160.)

yet markedly thinned out and bulging. The bladder was adherent to the old scar. A female infant was extracted with an asymmetry of the lower portion of the right face, apparently due to the distortion of the uterine cavity. Manual removal of the placenta was attempted but no plane of cleavage could be found. The uterine muscle was flaccid and soft and there was no bleeding. The diagnosis of placenta accreta was made, a supravaginal hysterectomy was decided upon and performed. The postoperative course was smooth. The patient made an uneventful recovery and was discharged in excellent condition two weeks after the operation. The asymmetry of the infant's face corrected itself within a few weeks.

PATHOLOGIC REPORT

Gross.—A supracervically amputated, very markedly enlarged uterus, measuring 210 x 220 mm. was received. The uterus has been sectioned along its anterior surface. The thickness of its wall varies from 38 mm. in its widest to 12 mm. in its narrowest diameter. In the right lower portion of the uterus, extending over an area of 110 x 108 mm. there is a piece of placental tissue which is firmly adherent

to the underlying structures and cannot be removed from the uterine wall without tearing portions of uterine musculature with it. On cross section, one cannot find a line of cleavage between the placenta and the underlying uterine structures, but one can already observe, with the naked eye, the irregular ingrowth of chorionic substance into the muscularis. Especially well marked is this ingrowth in the region of the old scar and in these places the muscularis is thinned out to 1 to 2 mm., with placental tissue reaching down to the serosa.

Microscopic.—Sections were taken from portions of the uterus, with and without placenta, and from the thinned out bulging portions of the scar region, where, grossly, no musculature could be noticed. They were stained with hematoxylin and eosin, van Gieson's stain, Mallory's aniline blue phosphomolybdic acid stain and Weigert's stain for elastic fibers.

The picture as observed under the microscope is a rather striking one. The chorionic villi extend deep into the muscularis without any intervening decidua



Fig. 2.—Marked hypoplasia of decidua vera. ($\times 160$.)

spongiosa or even compacta. For the most part, they are in intimate association with muscle fibers, pushing apart and destroying the muscle cells and penetrating towards the serosa. Only occasionally can a few distorted remnants of decidual cells be noted. The fibrinoid (hyaline) layer of Nitabuch, which is best demonstrated by Mallory's connective tissue stain, varies in thickness from 20 to 4 micra and in numerous places is broken through by the ingrowing chorionic villi. In the fibrinoid layer minute deposits of calcium can be seen. Very often the upper layers of the muscle cells undergo degenerative changes. They swell, show granular and hyaline-droplet degeneration, their nuclei lose much of their staining capacity and suffer kariolytic changes. They take on the appearance of decidua like cells. The lymph spaces and the veins between the muscle bundles are invaded by chorionic villi.

Sections from the region of the scar show only occasional muscle fibers. For the most part, the uterine wall consists of collagen fibrils with numerous fibroblasts covered by serosa. The placenta, i.e., the chorionic villi without decidua, rests directly on this fibrous layer and reaches the serous coat in places by separating the connective tissue bundles.

Sections from the fundus uteri reveal only a minutest decidual reaction of the endometrium. The decidual cells are small, with pyknotic nuclei and the cytoplasm is coarsely granular. This layer is only 30 to 60 micra thick. Glandular elements are absent.

Diagnosis.—*Placenta increta.*

DISCUSSION

The normal separation of the placenta is facilitated by the spongy decidual layer. After the expulsion of the fetus, the venous spaces fill with blood and as the contractions and relaxations of the musculature continue, separation occurs. If this layer is absent, one can easily perceive that separation will be more difficult. The partial or complete absence of decidua compacta will cause a still greater difficulty in the separation. If the chorionic villi are in direct contact with and penetrate into the muscle layer, separation will be impossible without tearing portions of the myometrium. In the presence of only a thin layer of decidua compacta or in the absence of same, we speak of placenta accreta vera. If the chorionic villi penetrate into the muscle layers, the condition known as placenta increta results. From these basic anatomic considerations one can easily perceive that the clinical course will be influenced by the extent of chorionic invasion.

Three factors are usually made responsible for this anomaly:

1. The condition of the uterine mucosa at the time of nidation of the ovum: maldevelopment of the uterus, infantile uterus with atrophy or hypoplasia of the endometrium are among the primary factors. Secondary destructive changes, due to repeated curettages, septic endometritis, vaporization, previous manual removal of retained placentas, diverticular pregnancies, atrophic, thinned-out endometrium above uterine myomata are etiologic factors of great importance. To this we would like to add previous cesarean sections with placenta formation at the site of the scar. The question, whether the scar disappears completely after repeated cesareans and is replaced by muscle tissue or whether the fibrous tissue persists, is still a matter of debate. Many obstetricians definitely deny the persistence of the scar; however, we have repeatedly seen, at the time of cesarean sections, as well as in hysterectomized and postmortem material after cesareans, the persistence of such scars.

2. Excessive growth of the chorionic elements. Some authors believe that a primary tendency toward excessive growth on the part of chorionic villi can be made responsible for this anatomic defect.

3. Insufficient antiferment production against the erosive power of the trophoblast, possibly due to deficiency in the hormonal cycle of the maternal organism. These assumptions are more or less of a theoretical nature and need further substantiation.

All of these three factors combined may possibly produce this anatomic defect; yet, from the study of the literature and from the evidence in our case, we would consider that endometrial defects are of greatest importance. The marked hypoplasia of the entire endometrium and the poor development of decidua, which for the most part was absent, the persistence of the scar from the previous cesarean section were the etiologic factors in our case. The fact that the chorionic villi penetrated to the serosa especially in the region of the scar brings up the problem of the advisability of low cesarean section, which we are not able to answer with the insufficient material at hand.

Placenta accreta has been noted at any stage during the course of pregnancy, from the third month till term. Unfortunately, the symptoms and signs occur rather late, mostly after the child has been delivered, and it is very easily mistaken for a retained placenta. Therefore, signs and symptoms which are helpful in the recognition of this condition before birth cannot be emphasized too much. The pronounced thinness of the uterine musculature, the insufficient amount of endometrial tissue to cope with the erosive activity of the chorionic villi, accentuate the similarity of tubal pregnancy and placenta accreta. Changes simulating decidual reaction in the upper layers of the muscularis in direct contact with the chorionic villi where decidua is absent are also common in both conditions. The clinical course is alike; the symptoms observed in our case—dark brown vaginal spotting, which is reminiscent of discharge found in tubal gestation, and the cramp-like pains in the lower abdomen—are of paramount value and led one of us to assume that an abnormality existed, whereupon it was decided not to delay the operation until term.

The therapy depends upon prompt recognition of the abnormality and all authors agree that early hysterectomy is the only procedure to be resorted to. The prognosis is good if the patient does not lose too much blood, and no sepsis from protracted attempted manual removal sets in.

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AN UNUSUAL ACARDIACUS

By T. M. BOULWARE, M.D., BIRMINGHAM, ALA.

(From the Norwood Hospital and Clinic)

MRS. C., white, aged thirty-one, gravida seven, first visited Norwood Clinic 2/20/30, being referred by her family physician because of high blood pressure. During her last two pregnancies the patient had noticed frequent headaches and dizzy spells and during her last labor she had several convulsions. Last menstrual period was 9/15/29 with preceding period the month before. Severe and persistent headache, dizzy sensations, black specks before the eyes, and dyspnea had been prominent symptoms for two months prior to clinic visit. No fetal movements were reported.



Fig. 1.

Examination showed a patient of white pasty complexion and with a moderate amount of edema of both lower extremities. There was also some slight puffiness about the eyes. The eyegrounds showed a typical albuminuric retinitis. The heart was negative, the B.P. 200/120. Blood findings were those of a moderately severe secondary anemia. The urine showed a high specific gravity, seven grams of albumen per liter, and many fine granular and hyaline casts. The N.P.N. was 33. The patient was admitted to Norwood Hospital same date and hysterotomy with sterilization advised.

On 2/21/30 the uterus was opened through midline incision. The placenta was encountered on the anterior uterine wall and one normal male fetus of 24 cm. delivered. Another smaller mass was then felt lower in the uterus, seemingly enclosed in a second membranous envelope. This second mass had its own small umbilical cord which appeared to be inserted near one end of the common placenta. After completion of the hysterotomy, sterilization by tubal section and ligation was done.

Laboratory examination of the specimens showed the following:

The normal fetus was well developed and its tissues in a good state of preservation. The second mass consisted of a fetal monster made up largely of connective tissue covered by skin. From one pole of the irregular fetal mass projected a foot. This foot was of the same stage of development as those of the normal fetus. The outer two toes were webbed. The bones of the thigh and leg were apparently present and the entire structure was attached to a deep central bony mass of irregular outline. A nipple-like body, similar in size and shape to the penis of the normal fetus, was also present. The umbilical cord of the monster measured 0.7 cm. at its point of fetal attachment. The large placenta was studded with small infarcts.

This interesting specimen offers much ground for speculation. From the findings the case appeared to have been one of single ovum twins with one chorion, two amnions, and two distinct umbilical cord insertions in the common placenta. As most of the tissues of the monster were of ectodermal and mesodermal origin, it is at least interesting to wonder if some accident during segmentation of the fertilized ovum could explain the abnormality. Fertilization of a polar body split off during maturation would seem unlikely because of the single chorion. Even if such fertilization were possible, as has been reported in certain insects, and the two ova imbedded in close proximity with subsequent partial fusion of chorions, we would expect to find not a single placental system but two, even though joined. Intrauterine amputation or mutilation from oligohydramnios does not appear likely from the findings. The most plausible explanation would seem to be that due to its larger placental area and better nutritional opportunities, the heart of the normal fetus was sufficiently strong to overcome that of the anomalous one, with subsequent degeneration of the weaker pump at an early stage of fetal development. The nutrition thus afforded the weaker twin was probably insufficient for its total needs and for some unknown reason the lower extremity and associated structures developed at the expense of the other tissues.

The maternal nephritic state may have been of some etiologic importance but probably was only coincidental.

2501 NORTH SIXTEENTH AVE.

CASE REPORTS

1. DOUBLE UTERUS, DOUBLE CERVIX, AND DOUBLE VAGINA

2. ABSENCE OF THE VAGINA

BY REXFORD W. MCBRIDE, M.D., WOODLAND, CALIF.

(From the Department of Surgery, Woodland Clinic)

CASE 1.—A woman aged twenty-five years entered the clinic complaining of attacks of frequency and dysuria of three years' duration. The attacks were of sudden onset and quickly increased in severity until she was forced to void small

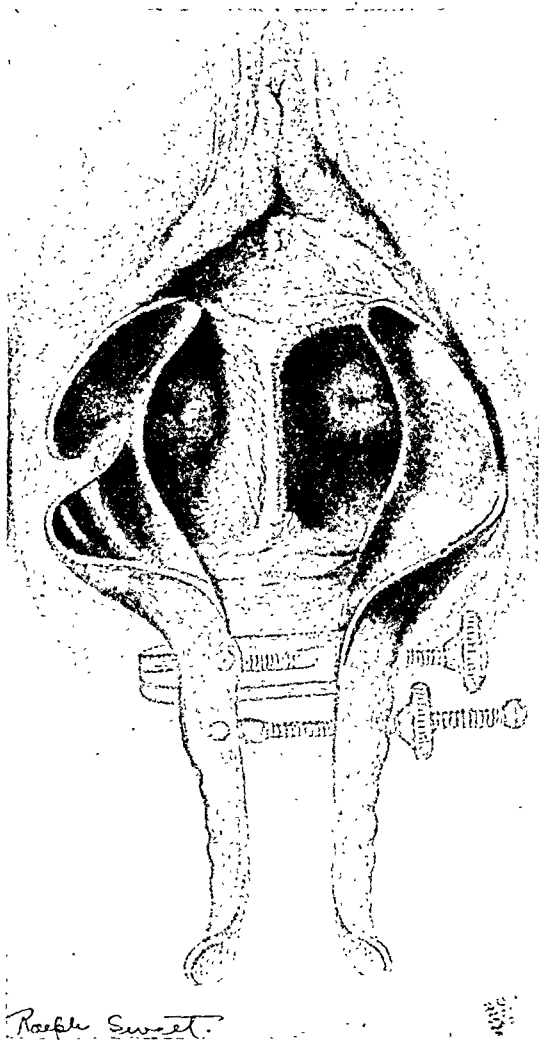


Fig. 1.—Double vagina and double uterus. Vaginal septum complete.

amounts every ten to fifteen minutes with marked dysuria. She also complained of a continuous aching pain in the left lower quadrant which was increased by any unusual exertion. Treatment had relieved her frequency and dysuria temporarily but had never affected her left lower quadrant pain. Incidentally she complained of sterility.

Routine physical examination disclosed nothing of import. Pelvic examination revealed two vaginas, the septum being complete and extending down to the hymenal ring. Both vaginas contained considerable thick yellow discharge, especially the right. For this reason, uterosalpingography was not attempted. There were two complete and normal cervixes, one for each vagina. There were also two distinct fundi which were anteverted, somewhat fixed, tender and apparently of normal size. Finally, there was a fairly large, tender, moderately firm, fixed mass on the left side of the pelvis (Fig. 1).

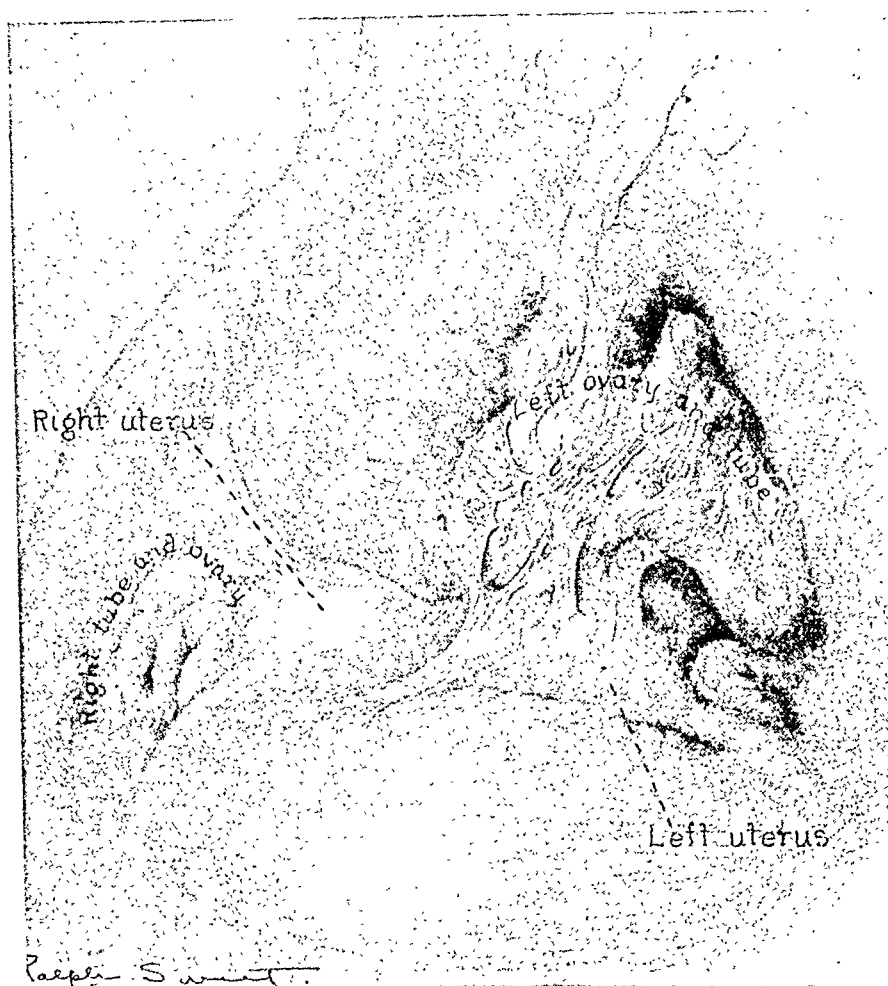


Fig. 2.—Double uterus and vagina. Two tubes and ovaries. Tuboovarian abscess, left, with pyosalpinx.

At operation two distinct uteri were found, with no fusion between them except at the meeting point of the two cervixes. On the left there was a cystic tumor 8 cm. in diameter which was firmly bound to the left uterus, posterior peritoneum and left ureter, by dense adhesions. This proved to be a pyosalpinx and tuboovarian abscess. The right ovary was normal. The right tube was markedly thickened, tortuous and bound to the posterior surface of the right uterus by firm adhesions. The right tube and left pelvic mass were dissected free and a double hysterectomy done (Fig. 2).

The postoperative course was uneventful. The patient has been entirely relieved of pelvic pain as well as of her urinary symptoms.

CASE 2.—A girl of eighteen years of age complaining of amenorrhea. There had never been any menstrual flow or any reaction suggesting a menstrual period.

General physical examination was entirely negative. There was nothing to suggest any glandular dysfunction. Her mentality was normal, perhaps a little above the average. She had no idea of her physical deficiency, nor had she the slightest knowledge of any sex reaction.

Laboratory tests, including basal metabolic rate, were normal.

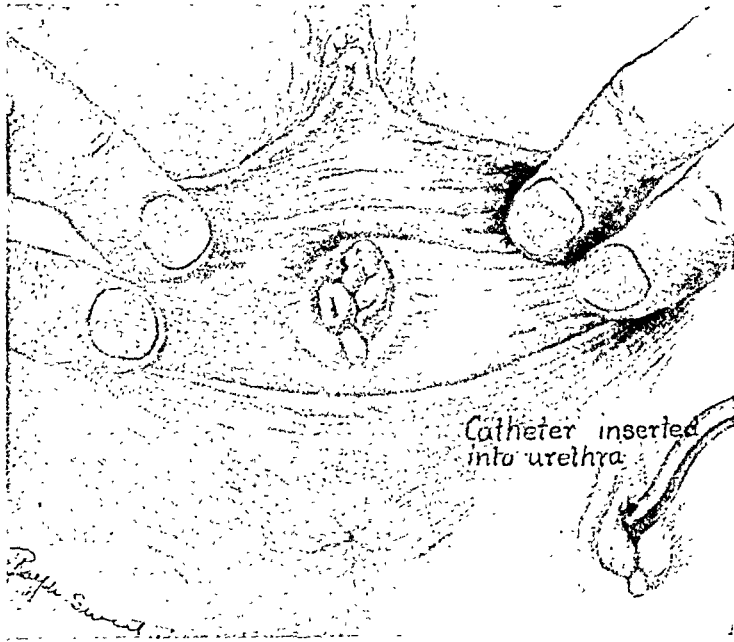


Fig. 3.—Congenital absence of vagina. No rudimentary organ demonstrable. No uterus demonstrable on rectal-bimanual.

Pelvic examination revealed a complete absence of the vagina. There was not even a dimple suggesting its usual location. The labia majora and minora were present but deficient at their lower extremities where they were fused into a broad, strong perineal body. On rectal bimanual examination no mass or nodule or any other suggestion of a uterus could be discovered, but there was a resistant band extending across the pelvis at about the level of the upper portions of the two broad ligaments. The ovaries could not be palpated (Fig. 3).

Plastic operation was offered and refused.

WOODLAND CLINIC.

Society Transactions

THE AMERICAN GYNECOLOGICAL SOCIETY

FIFTY-FIFTH ANNUAL MEETING

Hot Springs, Virginia

MAY 19 TO 22, 1930

1. **Ovarian and Pituitary Changes Associated with Hydatidiform Mole and Chorioepithelioma**, by Dr. Emil Novak, Baltimore, Md., and Dr. A. K. Koff, Baltimore, Md. (For original article, see page 481, October issue.)

DISCUSSION

DR. JOSEPH L. BAER, CHICAGO, ILL.—Most of the earlier references to the problem of lutein cysts, chorioepithelioma malignum and hydatidiform mole are noted by the essayist. It is of interest that Penkert in 1910 stated that neither a mole, a chorioepithelioma, or ovarian changes are primary but that the changes in the ovary and the formation of a mole might be caused by one hypothetical hormone. The essayist mentioned that in only one other case found in the literature had there been an opportunity of examining the pituitary gland. It is in a case of chorioepithelioma. Dr. Novak will, I am sure, welcome the data on three additional cases. Berblinger examined the hypophyses in two cases of chorioepithelioma. In one of his cases of chorioepithelioma the uterus was removed in the fourth month of pregnancy. The patient died three months later. Metastases were found in the lungs and brain. The hypophysis still showed "Schwangerschaftszellen," many eosinophile cells but no diminution of the basophilic cells. The author does not believe that there were more changes in the hypophysis than would be expected in such short time after pregnancy. Another case of Berblinger showed many chorioepithelioma metastases in both lungs. The hypophysis weighed 0.77 grams. The pregnancy was interrupted two months prior to death. The hypophysis contained many "Schwangerschaftszellen" in a state of involution but none fully developed. According to the quantity of tumor tissue which was present in the body, specific changes in the hypophysis should have been much more marked if there was an actual interrelation between chorioepithelioma and the hypophysis.

Gentili reports the case of a woman, widowed seven years, with a chorioepithelioma of the uterus and diffuse metastases. There was no corpus luteum present in the ovaries. The anterior lobe of the hypophysis contained colloids and lipoids and many pregnancy cells with a few basophilic and acidophilic cells and a passive hyperemia.

Concerning Dr. Novak's fourth case report, there are instances in the literature which show an apparent disappearance of the primary chorioepithelioma. Of course, it is questionable whether the disappeared tumor actually was a malignant chorioepithelioma. This subject is always open for discussion since none of these cases are posted because of recovery. But assuming that the primary tumor disappeared, why did the metastases not disappear also? R. Meyer in Stoeckel's *Handbuch der Gynackologie* (1930) expresses the relation of disappearance of primary chorioepithelioma to the metastases in the following words: "Was den Primaertumoren

recht ist, muss den Metastasen billig sein," the English equivalent of which may be interpreted as, "what is sauce for the goose is sauce for the gander."

Changes in the anterior portion of the hypophysis as seen for example in small adenoma or infarction of the hypophysis, produce a marked cachexia. If chorioepithelioma produces marked changes in the anterior lobe of the hypophysis we would expect in all these cases at least some evidence of cachexia. Did Dr. Novak's case show such evidence?

Berblinger mentions the case of a thirty-six-year-old male who died of a chorioepithelioma of the right testis with metastasis in the brain. The hypophysis was examined very carefully and did not show any changes similar to the ones found in the hypophysis in pregnancy. Probably, however, the group which this case typifies has no bearing, for these tumors are really teratomas and the patients lack two out of the triad of structures under consideration here.

DR. OTTO H. SCHWARZ, St. Louis, Mo.—The marked predominance of chief cells in the anterior pituitary lobe in a case of hydatidiform mole observed by Dr. Novak is of great significance on account of the numerous studies concerning the relationship between the anterior pituitary lobe and the ovary. The opportunity for such observations as Dr. Novak has made does not present itself often, and he is to be congratulated for his alertness in making this comparative study.

It is of interest to mention that the picture which is described in the ovary in cases of hydatidiform mole, is more exaggerated but somewhat similar to the follicular atresia taking place before puberty and during normal pregnancy.

I believe that the chief cells are a more predominant cell in the anterior pituitary lobe before puberty than are the eosinophiles. The observation of Dr. Novak points out that these same cells, so-called chief cells, are markedly increased in hydatidiform moles just as they are in normal pregnancy.

It has always seemed to me that the luteinization which occurs in the mouse in the Zondek-Aschheim test, appears more as a theca luteinization than a granulosa luteinization. I should like to ask Dr. Novak about this particular point.

I believe there are now four hormones described for the anterior pituitary lobe: the growth hormone, supposedly connected with the eosinophiles; the hormone causing increased specific dynamic action of food stuffs (Kestner) and the two hormones associated with follicular changes and luteinization in the ovaries. I believe all this work will result in a more thorough study of the histology of the pituitary body in various stages of the life cycle in order to determine possibly what particular cell types may be responsible for any particular hormone.

DR. COLLIN FOULKROD, PHILADELPHIA, PA.—It seems to me that this presentation should not be allowed to pass without a word of commendation. It represents a new line of thought. When at Jefferson Hospital, Dr. Bland removed a chorioepithelioma of the uterus showing double ovarian cystoma, I had occasion to look up the literature on the relationship of these cysts to such a condition. I was amazed to find that in the most comprehensive pathology and in more recent work there was very little, if any, reference made to the changes in the pituitary and ovaries associated with hydatidiform mole or chorioepithelioma. I believe it represents a very interesting line of thought and may prove that there must be something or other that prevents many pregnancies from developing into chorioepithelioma.

DR. NOVAK (closing).—I am indebted to Dr. Baer for bringing together a few more cases in which some study of the histology of the hypophysis has been made in instances of hydatidiform mole or chorioepithelioma. I was also much interested in his reference to the question of the occasional disappearance of the primary tumor in cases of chorioepithelioma. Our case 4 was an instance of this type, although I

did not have time to present it in the brief summary of our paper which I made. This unusual case we are describing in full in another paper, which will soon appear in the *AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY*. In this case there was no question that there had been a primary chorioepithelioma in the uterus, as we had the opportunity of studying the original curettings, which had been obtained long before general dissemination occurred. I do not believe that cachexia is of very great importance from the standpoint of diagnosis, any more than it is in the diagnosis of malignancy generally. In advanced cases one would, of course, expect to find it.

Dr. Schwarz brought up the interesting question of the morphology of the lutein cells in cases of the group which we have described. I agree with him that in many instances, as in some of those which I showed on the screen, the lutein cells resemble the typical granulosa lutein cells of the corpus luteum far less than they do the paralutein cells, which are, of course, of thecal origin. On the other hand, as we have also shown, the lining of some of the cysts is of the genuinely granulosa cell lutein type.

With regard to the pathologic physiology of the subject, I believe we should still be quite conservative. New hormones are being described almost from day to day, and broad conclusions are being reached on very insufficient evidence. For example, Zondek describes in the hypophysis a hormone which he calls Prolan A, concerned with follicle growth and related to folliculin, and another hormone which he calls Prolan B, associated with the corpus luteum development and related to the hormone of the latter (Progestin). The evidence for this conclusion, however, is not by any means complete. On the other hand, there can be no doubt that these recent studies will throw a great light upon the question of the origin and significance of such lesions as we have described.

2. The Present Status of the Treatment of Carcinoma of the Cervix Uteri, by Prof. Erwin Zweifel, Munich, Germany. (By invitation.) (For original article see page 595.)

DISCUSSION

DR. GEORGE GRAY WARD, NEW YORK CITY.—Prof. Zweifel presents the German viewpoint of this very important subject of cancer of the cervix. As he pointed out, it is an undecided question whether operation, irradiation, or some combination of the two is best. The figures for radical operation and irradiation are nearly the same. Of course, when we speak of operation we are speaking of a case that is presumably operable. When speaking of irradiation we include that very large group of cases where operation is out of the question. At the Woman's Hospital, in the light of our experience of over eleven years with the use of radium, we cannot accept the idea that operation alone is better than irradiation in cancer of the cervix.

The question of operative technic was brought out by Prof. Zweifel as being very important in determining results. We all know how very variable it is. The same thing can be said of the technic of irradiation. I am sure all of us who have seen many of these cases come across instances of gross abuse of radium. It requires skill in the use of it just as in operations. There are a comparatively limited number of men who are competent to do a proper radical operation for cancer of the uterus, taking the profession by and large. Now the operative technic has presumably in the best hands reached its zenith, but that is not true of irradiation. We are learning more and more each day regarding the technic of irradiation.

The great difficulty in studying the statistics is in knowing the extent of the disease in the cases reported. Heyman stated recently in this country, that he had three presumable experts, all members of the American Gynecological Society, examine a case to decide what degree of the disease existed and they all disagreed. I was one of them. It is true one man calls a case operable and another inoperable and that is what makes it so difficult to make a comparative study of the various statistics. For instance, in the Woman's Hospital operability definitely means, so far as we can tell, the disease limited to the cervix, or in other words "borderline" or less. If we can demonstrate in any way that it is beyond the cervix we call it inoperable. Of course, we well know that Victor Bonney in London would operate on many of those cases that we called inoperable because he operates where there is a very definite invasion of the parametrium and vagina. His figures are very interesting given in his recent Hunterian Lecture of last February. He has seen 450 cases, operating 284 of them with the radical Wertheim technic with five-year follow-up. He had a 16.5 per cent total primary mortality, 8 per cent in his last 98 cases, so this shows that he is improving his technic. His relative cures were 38.7 per cent; that means operable cases from his standpoint. His absolute cure rate is 24.4 per cent. He found 43 per cent of the glands involved.

I have just completed a study of eleven years of work at the Woman's Hospital and I have made a report to be published later. It is an analysis made by professional statisticians of our total work and I will simply give you an abstract of the figures compiled. In eleven years and three months we had 259 cases, of which we had to reject 8 cases that were absolutely hopeless. We have treated 251 cases. Of these 25.9 per cent were in what we call the operable class, that is confined to the cervix; 74.1 per cent were beyond that stage. We had a primary mortality treated with radium of 1.1 per cent.

Our five-year end-results are 63 living, giving us an absolute cure of 24.3 per cent and a relative cure of 25.1 per cent.

Of these cases we treated 170 by our own method which Dr. Farrar and myself have developed, using radium alone. We give the original treatment, reradiate whenever necessary and personally follow up the cases through the five years. Our relative cure rate in that group was 25.3 per cent.

A point of considerable interest is that in the follow-up of these cases there were 8.6 per cent of the early group (Class I and II) which we have been unable to trace, while there were only 1.5 per cent of the advanced group which were not traced. It is probable that some of these early cases not traced are well and living but that is, of course, only an inference. Of the early cases treated by our own method we have 57.1 per cent alive and well after five years. We published our last report two years ago and now we have two more five-year series amounting to 88 cases, giving us a relative cure of our last two years of 26.1 per cent. As to age we have had 15 cases in the twenties, the youngest being 24 years of age.

We have been using high voltage x-ray only for the past year because we did not have the apparatus previous to that time. We have treated 35 advanced cases only, with radium and high voltage x-ray during this period.

A point of interest is that Pitts and Waterman of Providence, R. I., working with radium and following a similar technic to ours, have shown me their figures. They have seen 90 cases, 88 of which they have followed and they have obtained an absolute cure of 17.4 per cent, showing that others can carry out this line of treatment, without high voltage x-ray with benefit.

In conclusion, I believe the smaller dosage of radium and the frequent follow-up, with reradiation whenever indicated (and that sometimes means several years after the initial disease), will be found to be more valuable than the heavier dosage, and I look with high hope to the high voltage x-ray to improve our statistics. We

hope that it will take care of the 40 per cent of gland involvement. Without the high voltage for the glands our absolute cure of 24.3 per cent is nearly equal to Bonney's 24.4 per cent. More time is necessary to prove Prof. Zweifel's contention that the combined method will give the best results. Until the combined method shows better results in spite of primary mortality, we prefer to employ irradiation alone in cancer of the cervix.

DR. JOSEPH BRETTAUER, NEW YORK, N. Y.—There are three points I would like to make. First, that cancer statistics are not a reliable means for getting an insight into cancer results. We know that each cancer differs in its pathology and therefore in its prognostic features; as long as we have not a uniform method of grouping these cases, statistics do not give us the actual conditions. Furthermore, reliable follow-up work is lacking, such as is carried for instance in Sweden (under Government control).

Second, in connection with the suggested preoperative radiation, I believe that complications like vesical and urethral fistulas will result more frequently, because technical difficulties caused by radiation will have to be overcome.

Third, I am convinced that the occurrence of cancer of the cervix in women of the Jewish race is infinitely smaller than in other races, the report compiled by the Cancer Committee of the League of Nations to the contrary notwithstanding. This conviction is based upon an experience of forty years in hospital and private practice, with a clientele predominantly Jewish, and coincided with that of the Chief of a Woman's Hospital in Kiev, Russia, with whom I was in communication in 1908, and whose figures were essentially the same as mine.

PROF. FELIX VON MIKULICZ, BERLIN, GERMANY.—I have come to the United States in order to study the different methods of treatment of carcinoma of the female genital organs, which as we know also in Germany, are very successful. I have already learned a great deal and I will try to utilize my experiences after returning to Europe.

I was most impressed by the histologic differentiation of the types of carcinoma and their classification in radio-sensitive and radio-resistant groups. I believe that we thereby will be able to improve greatly our therapeutic results.

In studying the statistics of the world dealing with carcinoma of the cervix, we are impressed by the fact that on the average the results are similar not only by radio therapy but also by operative treatment.

These results, which mean that we can save only every fourth affected woman, are not satisfactory and compel us to try to improve our therapeutic methods. The similarity of results, however, prove that we shall be able to progress rather by the utilization of our knowledge of the biology of the carcinoma than by the improvement of the different methods of treatment. The aid, therefore, may be looked for in the histologic feature of the carcinoma. If there are two groups of cervix carcinoma, namely, the radio-sensitive and the radio-resistant, and if the pathologist is able to differentiate them, then we should only irradiate the first group and operate upon the second group.

The Stoeckel Klinik of Berlin has been treating for the last one and a half years all cases of carcinoma of the cervix with radium and combined operation. Every case of carcinoma of the cervix receives first two 5 to 6000 milligram hours of radium distributed over cervix and vagina. Three months after beginning of the treatment in all cases where operation is possible (a large number of the primary inoperable cases become operable by the irradiation) the radical hysterectomy of Schauta-Stoeckel is performed. The operative mortality is 7 to 8 per cent. A deep x-ray irradiation follows after a complete convalescence, a procedure which is also applied in those cases which did not become operable after irradiation.

Naturally, we are not able yet to report about permanent cures. The leading thought, however, of our method is, I believe, good. We try to combine the advantages of radium and x-ray therapy with the advantages of the operative treatment and we succeeded in reducing the primary operative mortality to a great extent.

Histologic examinations prove the value of our methods. The uteri of cases which were primarily inoperable, and which became operable by the irradiation, were histologically examined and intact carcinoma cells were found in the parametria. That shows clearly that the radical operation can greatly improve results where radiotherapy has been previously used.

But after the experiences developed in the United States it will probably be better to not operate on all cases of carcinoma as we used to do heretofore, but to use operative procedures in the radioresistant cases only. We may assume that thus we shall be able still further to reduce the primary mortality, and by the combination of radiotherapy and operation we can improve our results.

DR. WILLIAM P. HEALY, NEW YORK CITY.—Those of us who meet Dr. Heyman when he was here about five or six years ago with Prof. Forssell may remember that they both opposed the use of external irradiation in carcinoma of the cervix. The late Harold Bailey always emphasized the necessity of external irradiation in the treatment of carcinoma of the cervix and in the early years he applied radium about the pelvic girdle as well as at the site of the lesion. When I succeeded him at the Memorial Hospital we continued the plan of cross fire with radium applied in the cervical canal against the cervix and we substituted x-ray, low voltage machine, for radium externally.

We have treated about 2000 cases and our total salvage of all cases is about 25 per cent. We have an exact follow-up on all of those cases and we count them as dead if we do not know where they are.

In 1922, 1923, and 1924 when we were using low voltage x-ray for external irradiation, we have in those years 44.5 per cent of five-year freedom from recurrence of active disease in all of the favorable cases and 65 per cent in early cases.

We feel that surgery has very little value in carcinoma of the cervix except in certain instances where the primary disease of the cervix fails to respond to radiation therapy satisfactorily and the patient still has a uterus that is removable surgically. If one attempts further irradiation in that type of cervix you will bring about a persistent necrotic and painful ulcer, whereas hysterectomy will at least heal over the vaginal vault even if it will not permanently cure the disease and will therefore render the patient more comfortable. We believe that external irradiation with high voltage x-ray will improve the 44.5 per cent results which we were able to show with low voltage x-ray.

We know that the majority of the cases, 60 per cent of them, that come to us for treatment are in an advanced stage and cannot be cured. In many of them we are doubtful if we can use radium and we give them first a high voltage pelvic x-ray cycle consisting of five exposures which surround the pelvic girdle and the space which is centered over the third lumbar spine so as to affect the prevertebral lymph glands. The patient is instructed to take several douches daily. Frequently at the end of ten or twelve days the lesion will have responded so completely and so well that the infection will have subsided, the necrotic tissue will have disappeared, and it will be possible to go ahead with radium in a complete way rather than in a partial way. I would like to recommend that high voltage x-ray be used as a routine procedure first in all of the less favorable cases.

DR. WILLIAM S. STONE, NEW YORK CITY.—There is one point that has been considered only slightly today, which is most important. I believe that perhaps the greatest contribution that has been made in the last two years to the study of

cancer is its histologic gradation, which was introduced in this country by Broders of The Mayo Clinic. It is not necessary to follow his classification, but I do think that at the present time a diagnosis of cancer of the cervix without qualifications regarding its type means nothing. There are so many different kinds of cancer of the breast and of the cervix. Most of us are not sufficiently competent to judge of the histologic nature of these tumors without the aid of a pathologist. If Dr. Bonney, who has just been quoted by Dr. Ward, had more carefully analyzed his cases in conjunction with some pathologist and had selected cases for his operations with regard to their malignant qualities, his cures would have been a great deal higher. If you stop to consider it, surgery has never had a fair show, and this study of the different malignant qualities from their histologic characteristics will aid materially in the choice of the method of treatment. Cancer of the cervix offers a wonderful opportunity to show the value of this study.

DR. JOHN A. MCGLINN, PHILADELPHIA, PA.—It seems to me if progress is to be made in the treatment of carcinoma or any other serious malady an important thing is the early diagnosis of the disease and of those conditions which may lead to the disease. The time has now arrived when the profession must realize that it must assume an entirely different attitude toward the body politic. Things have changed considerably. It is no longer possible for us not to take an active part in public health education. The body politic is realizing, very forcibly, the economic value of good health and is taking away from the medical profession leadership in public health matters. In many cases their leadership is not particularly good and they are wasting a lot of money and not getting the best results. In this problem, as in all public health problems, there are two things to be considered: the proper education of the doctor after he graduates and proper education of the public. It does not do to have large meetings on cancer, with some star orator to lecture to the men who are going to send us cases, because after all he addresses only a certain number of people and what he has to say is usually over the heads of his audience. I believe it is much better to do what we have inaugurated in the Philadelphia County Medical Society, a series of cancer days where the subject of cancer is brought down to the level of the man who is going out to see a case and refer it to some one else. These small group meetings are much better than large public meetings. Illustrations are shown of what cancer is, specimens are shown, and a plain talk given on the necessity of the early recognition of the disease, talks on precancerous lesions, etc. This will accomplish a great deal more than the methods we have been following.

We must assume leadership and we must realize that our methods of disseminating knowledge to the public as we have used in the past are entirely erroneous. The Philadelphia County Medical Society has recently established a bureau of public information and we have the cooperation of broadcasting stations and the press in the dissemination of proper knowledge to the public. We are avoiding the establishment of unnecessary clinics or clinics in places where they are already existing.

DR. FREDERICK J. TAUSSIG, St. Louis, Mo.—Regarding the matter that Dr. McGlinn has just spoken of I should like to sound a pessimistic note. In 1913 we started the movement to control cancer by education. When I think that seventeen years have elapsed and that our percentage of curability is just about the same as it was in 1913, I think those wonderful dreams that we had at that time are no longer to be entertained. We must realize that in spite of the very excellent methods—and I think under Dr. Howard Taylor's leadership, the United States has done a great deal of educational work not equaled by any other country in the world, and in spite of the most detailed effort to get information to the public and to the profession, we have done very little to increase the percentage of

cures. People still fear to come to the doctor for treatment and all that we do has a relatively small effect in obtaining these cases early.

Prof. Zweifel gets 25 per cent of cures and possibly by intensive educational methods we may raise that to 30 per cent, but do not let us delude ourselves into thinking we can accomplish more in this campaign of education than human frailty will permit.

I should like to emphasize also what Dr. Ward has said about reradiation. It seems to me that has not been stressed as much as it should. In following up our cases at the Barnard Hospital we at times have had occasion to catch recurrences in a very early stage and have been able to prolong and sometimes to save a life by such reradiation.

DR. LILIAN K. P. FARRAR, NEW YORK CITY.—I am glad to speak on the matter of education that has been taken up, but when we talk about operation and radium treatment for cancer in a country as big as this and compare it with one center of a country in Europe we are getting rather a wrong impression and we are not going to lessen the mortality from cancer. If we could have a method of applying radium demonstrated perhaps by the Cancer Control Society throughout the big cities, it might be a very good thing to educate those who would use it in a short time. It is not possible for a man even with Victor Bonney's skill to develop a technic in a complete hysterectomy of the Wertheim type without years of work. Yet it can be demonstrated how to apply radium, how to follow it up, how to give the second, third, and fourth application of radium needles which we do in the Woman's Hospital with good results. It seems to me in that way we really could educate people and lessen the mortality of cancer.

The theory of cleaning up the cervix was done years ago by Schauta by treatment with douches and in that way it was his object to make the uterus sufficiently mobile for operation. That can be done, as well as lessen the absorption that takes place with the application of radium. If in addition to that blood transfusions are given it will be a great benefit. I never apply radium to a patient who has less than 50 per cent hemoglobin and 3,500,000 red cells. If the patient is in better shape before radium is applied the result is a great deal better.

As Dr. Brettauer said, it is a difficult thing to do a hysterectomy after radium has been applied provided it has been applied long enough before so that the connective tissue has developed in the cervix. The time for operation, if one is to do a hysterectomy, is as soon as the slough has disappeared so that the danger of infection is over and connective tissue has not developed.

PROF. ZWEIFEL (closing).—Dr. Ward referred to the methods of irradiation. We always treat patients with radium and x-rays. We do not attempt operation in those cases because of the high mortality, but irradiation is always done. It is a great pity that the results of cancer treatment are not known and realized at once. Therefore, I think it is absolutely necessary that students should be informed about the treatment with x-ray and radium so that they may know when they are practicing physicians whether the treatment has been properly done or not.

Certainly to treat cancer with radium and x-rays is at least as difficult as to perform an operation.

I have given you only the percentage of absolute cures because I think in so many cases it becomes evident only during the operation whether the case is operable or not. It is not of much use to make a comparison between the relative cures for operative cases and radiation cases. The great advantage of the irradiation is that it has no mortality and certainly we shall have better success if the patient would come early in the stages of the disease.

Some statistics from Leipzig in 1921 show that they had taken out all the early cases of cancer which were treated with operation at that time and the

relative percentage of cures was 87 per cent. Of course, this is only for the very early cases coming within about four weeks after the beginning of the symptoms. That shows the very great importance of getting the patients as early as possible, and this is really the only chance to improve the results.

For comparison the results by Heyman are probably the most valuable ones because the clinic in Stockholm since starting radium treatment has nearly always followed the same method of treatment. We have changed our method several times, Regaud as well.

Dr. Ward mentioned that perhaps it is better to give smaller doses of radium and to repeat them oftener and we have found that for the first two years in Munich when we were giving rather small doses, repeated as a rule after two or three weeks, sometimes even after ten days, we had the best results. At this time we had a little over 20 per cent. Giving the very big doses has not improved our statistics but has made the results worse.

The treatment with high voltage apparatus has been mentioned. We ought not to forget that x-rays are very valuable also for the treatment of cancer. This has been absolutely proved. For instance, if you take the postoperative irradiation of cancer of the breast, this has nearly all been done by x-rays. Taking the statistics of H. Meyer in Bremen, and from the surgical clinic of Kiel, the patients were operated upon by the same men; half of the cases had postoperative treatment with x-rays, and gave about 70 per cent cures, and the other half not receiving postoperative irradiation showed only about thirty-five per cent of cures. The x-rays are certainly a help if properly done. The pelvic transverse measurement is between 6 and 7 cm. and we cannot get a very good effect with radium at more than between 3.5 to 4 cm., and the highest 5 cm. There are still 2 cm. left and all those who have operated know that just at the end we very often find cancerous infiltration.

Dr. Brettauer mentioned the importance of following up the patients, of paying their expenses if necessary as done in Sweden. We try to do as much of that as possible but, of course, the question of expense is a very difficult one. In every country money is spent for a campaign against tuberculosis, so why should it not also be spent for the very important campaign against cancer if we realize that the death rate of cancer is higher than that of tuberculosis?

As Dr. Brettauer said, operation after irradiation is something very different from primary operation alone. I quite believe that. I have not done it myself but we hear of cases of fibroids which had to be operated upon and sometimes they show induration. If the operation is to be performed after preoperative radium treatment, one should not wait longer than two or three weeks. If the operation is performed after the lapse of some months I quite agree with Dr. Brettauer that one may find very great difficulty.

Dr. von Mikulicz mentioned the difference in the classification, dividing the cancer cases into several groups. About four or five years ago I did some work along that line and also, in conjunction with a pathologist, wrote a paper on the subject. I do not think we can yet make this classification with certainty but we have found out that evidently those cases of cancer where there is inflammation in the cancer itself and many mitoses have a better chance of cure.

As to treatment with x-rays, I believe it is very important to choose the proper method and I still believe in the method with smaller fields, 6 to 8 or 8 to 10 cm., but I am very much against the big fields, one from the abdomen and one from the back, because with these big fields not only the cancer and the other organs are irradiated but also the blood stream passing through, and it has been mentioned that the blood cells are very important in the application of irradiation. A satisfactory resistance of the tubal organism is very important as the organism has so built up connective tissue for the growing cancer.

3. Postsalpingectomy Endometriosis, by Dr. John A. Sampson, Albany, N. Y. (For original article see page 443, October issue.)

DISCUSSION

DR. EMIL NOVAK, BALTIMORE, MD.—Dr. Sampson's observations indicate that these endometrial inclusions in the uterine cornua are not infrequently found where there has been no amputation of the tube. We know very little as yet about the manner of transition of the endometrium into the tubal mucosa, even under normal conditions. It has long been known that in inflammatory disease one frequently finds islands of mucosa deep in the musculature of the cornua, so that a section through the latter will often show the lumen of the tube apparently split up into many small lobules. This picture was described many years ago by Chiari, especially in connection with tuberculosis, though it is frequently seen in nontuberculous inflammations.

In many of these cases there is definite histologic evidence of the inflammatory nature of the lesion. On the other hand, one not infrequently finds pictures similar to those seen in adenomyoma of the uterus, with islands of typical endometrium in the muscle, and with no evidence of inflammation. It is possible, though not probable, that such islands were really produced by inflammation, and that all trace of the latter has disappeared, as it so often does in endometrial tissue. It seems more likely that such pictures are caused by a noninflammatory downgrowth of endometrium, such as occurs in uterine adenomyoma.

These conditions are exactly similar, it seems to me, to those which Dr. Sampson described in his tubal stumps, so that I think the only question to be decided is as to whether tubal amputation may not increase the incidence of these pictures. It is quite possible that this is true, and yet I do not think that the clinical importance of these changes can be very great, inasmuch as endometriosis about tubal stumps is certainly not very frequently described, even though most of us are now fairly alert to the occurrence of endometriosis generally.

Dr. Sampson differentiates rather sharply a tubal and an endometrial type of inclusion. I think one must be rather careful in attributing any great importance to this, because of the interchangeability of type which is apparently characteristic of müllerian tissue. For example, in endometrial cysts of the ovary one may find perfectly typical uterine mucosa in some portions and perfectly typical tubal mucosa in others. This interchangeability is not surprising to those of us who are inclined to accept the celomic metaplasia theory of endometriosis. After all, the evidence as to either one of the two chief theories is largely circumstantial. Every man must make himself a judge and weigh the circumstances on both sides.

The last picture shown by Dr. Sampson, in which an endometrial hematoma was perched up on top of the uterine cornua, would suggest to me that the endometrium in the tubal stump is probably an extension from the ovarian endometrioma. This would seem natural because of the admittedly great frequency of endometrial cysts of the ovary, and the admitted tendency of endometrium in certain cases to proliferate into adjoining tissues.

DR. EVERETT, BALTIMORE, MD.—Two years ago I had the privilege of hearing Dr. Sampson's first paper on this subject. I remarked at that time that I had seen frequently pictures similar to those shown by Dr. Sampson in sections taken from cases in whom there had been no previous operation. How many such cases I had seen I was unable to say, but now I am prepared to give definite figures.

I have studied 122 cases and of that number 37 or approximately 30 per cent showed this follicular gland-like picture in the uterine cornua. That is a somewhat higher figure than Dr. Sampson gives for his own similar series of cases, but still considerably lower than he found in his postoperative cases.

I have several slides which show the similarity of this type of picture to that found in the postoperative cases. I also found that in ten of the one hundred and twenty-two the interstitial and isthmic portion of the tube was lined not by endosalpinx but by definite endometrium.

I might add that in four of my thirty-seven cases showing the gland-like structure in the uterine cornua the lining of the spaces was endometrium alone. In four others some spaces were lined by endometrium, while others in the same sections were lined by tubal epithelium. In the other twenty-nine the spaces were all lined by tubal epithelium.

DR. OTTO H. SCHWARZ, St. Louis, Mo.—In an experimental study dealing with intestinal anastomoses, a marked overproduction of the mucosa takes place in early healing. In studying scars in the uterus of the guinea pig, following cesarean section, I found this same marked overproduction of the endometrium at the site of the incision. In the lesion that Dr. Sampson described, I feel that this takes place in the tube and uterine cornua, resulting in a picture similar to endometriosis and adenomyosis.

I believe that cauterization of the stumps might lead to less overproduction of epithelium.

DR. SAMPSON (closing).—Tubal stumps were studied by us from one hundred consecutive patients who had a previous salpingectomy or tubal sterilization. Misplaced müllerian mucosa was found in the stumps of eighty of these patients. As bilateral salpingectomy or tubal sterilization had been done in forty-seven, one hundred and forty-seven stumps were studied with one hundred and twelve instances of misplaced müllerian mucosa in and about the stumps. Our controls were studied in the same manner as the stumps. In one hundred uteri removed for various conditions misplaced müllerian mucosa was found in or about the uterine portion of the tubes in thirteen; three of these were bilateral. Therefore two hundred uterine cornua were studied in this group with an incidence of misplaced müllerian mucosa in the cornua of sixteen. In the uteri from fifty patients with gross evidence of pelvic infection misplaced müllerian mucosa was found in the uterine cornua of fourteen. Five of these were bilateral. The incidence of misplaced müllerian mucosa in one hundred uterine cornua from these fifty uteri was nineteen. The comparative statistics show, including those of Dr. Everett, a great increase of endosalpingiosis in the operative cases over the nonoperative ones.

In our studies of uterine cornua we have tried to determine where the uterine mucosa ends and the tubal mucosa begins. It has been extremely difficult in many instances. In some cases histologically typical uterine mucosa will extend almost into the isthmus of the tube. In our controls we were interested in determining the source of the misplaced mucosa. In two cases it occurred from a peritoneal endometriosis; in two others it arose definitely from the mucosa of the uterine cavity; in the remaining it came from the tubal mucosa itself.

For two years we have been using the electric cauterium in severing the tubes. We cauterize the end of the interstitial portion of the tube in order to destroy the overactivity on the part of this epithelium. Most of our cases of endosalpingiosis of the tubal stumps were of purely scientific interest. There were four instances of invasion of the ovary by sprouts from the tubal stump with the formation of typical endometrial cysts of the ovary, three of the invasion of the abdominal wall and four of the invasion of the intestine. In addition there were two ectopic pregnancies developing in the tubal stump. I believe this whole subject is of considerable clinical importance and that if salpingectomy is indicated we should do a hysterectomy, except as stated in my paper.

The majority of these cases were operated upon for other conditions than the postoperative endosalpingiosis, six of them for cancer of the uterus. In the majority of

the patients had the uterus been removed at the first operation, the second operation would not have been necessary and the lives of two of the patients might have been spared.

4. **The Roentgen Ray as an Adjunct in Obstetric Diagnosis**, by Dr. Harvey B. Matthews, Brooklyn, N. Y. (For original article, see page 612.)

DISCUSSION

DR. DOUGLAS P. MURPHY, PHILADELPHIA, PA. (by invitation).—Regarding the possible effect of irradiation upon the fetus, in the recent studies made at the University of Pennsylvania, we have been interested primarily in therapeutic irradiation. It has been conclusively shown that the therapeutic use of irradiation, experimentally and clinically, is likely to be injurious to the fetus. Of some 76 women who received therapeutic pelvic irradiation during pregnancy and went to term, about one-third bore infants which showed arrest of development.

A lack of dosage standardization prevents a satisfactory comparison of the effects of different dosages upon the development of fetuses. In going over case reports from the literature, and from the answers to the questionnaires we sent out about a year ago, we made an attempt to correlate the dosages of irradiation given in different clinics, with the evidence of damage in children irradiated in utero. It was impossible, however, to correlate them so that any satisfactory comparison could be made. Therefore, we do not know what the minimum dosage is which will injure the fetus. Hence we cannot say what amount of irradiation (diagnostic or therapeutic) during pregnancy is absolutely harmless. In the case of therapeutic irradiation the frequency of damage was found to be in proportion to the amount of irradiation.

We received one very interesting report dealing with diagnostic irradiation given during pregnancy. A patient suffering from urinary symptoms was subjected to two large series of roentgenograms. It was later discovered that she had been several weeks pregnant at the time the roentgenograms were taken. She gave birth at term to a child which was described as "a cross between a Mongolian idiot and a cretin." This is the only case that we know of in which a pregnant woman received roentgenographic radiation early in pregnancy, followed by the birth of a maldeveloped infant. This militates against the use of diagnostic x-ray during pregnancy, especially if we could find many such observations. No doubt many thousands of roentgenograms have been taken during pregnancy, and so far as could be learned there were no reports in the literature up to 1927 which would indicate that such roentgenograms taken during pregnancy were harmful. So that, although we have a record of this one observation to suggest that roentgenographic irradiation resulted in the birth of one unhealthy child, there must be thousands of cases to the contrary. It would seem, therefore, that before we condemn this practice we should secure more evidence either for or against its uses. That evidence is lacking as far as the literature is concerned. It would be interesting if the men who are taking roentgenograms during pregnancy would collect data upon this point. Though we do not know the dose of x-ray which can be safely used, we do know that the earlier in pregnancy irradiation is used, the greater likelihood there is of the fetus being damaged, and the larger amount of irradiation the greater the damage is likely to be, so that in general in the use of the diagnostic x-ray it would seem wise to delay irradiation as long as possible and to use the minimum number of exposures.

This opinion is based upon observations secured during a study of the effect of therapeutic irradiation upon pregnant women. It may be perfectly safe to take

many x-ray pictures during the first weeks of pregnancy. Until we get definite evidence that such amounts of irradiation are harmful I think it is safe to continue the practice. X-ray pictures, if taken as late as the eighteenth week, will probably do no harm. We cannot predict what will happen if roentgenograms are made in the early weeks of pregnancy. Hence when any roentgenograms are required, especially if there is any doubt as to the question of an early pregnancy existing, it would be best to be sure that the patient is not pregnant. This warning may not be necessary, but it is wise to consider it in the light of our general knowledge upon the subject. If diagnostic irradiation is performed later in pregnancy there is little likelihood of any damage resulting.

DR. WILLIAM C. DANFORTH, EVANSTON, ILL.—Dr. Matthews did not refer to any of the methods of x-ray mensuration that have been developed and I am very glad that he did not, because while very interesting from the scientific point of view, they are very deficient in practice.

Dr. Matthews emphasized the importance of taking the pictures from two planes, anteroposteriorly and laterally. We have found that this has helped us considerably.

From the standpoint of practical obstetrics I think there are just a few things that should be emphasized. X-rays are often of great use in determining the position of the child and the presence of abnormalities. Particularly should placenta previa or hydramnion be present I think it is important that an x-ray be taken before determining upon any procedure because the rather frequent incidence of monsters in the presence of these abnormalities might cause a change in the operative program.

I was interested to see that Dr. Matthews has been able to diagnose pregnancy so early. The earliest that we have diagnosed it has been five months.

DR. ALEXANDER M. CAMPBELL, GRAND RAPIDS, MICHIGAN.—I should dislike to practice obstetrics without having access to a well-trained roentgenologist.

I want to report some work that our roentgenologists and my associate, Dr. J. D. Miller, have been doing recently. They have been injecting in about 25 cases small amounts of a solution of strontium iodide into the amniotic sac and have obtained a good outline of the fetal soft parts. They have been able to locate the placenta in the majority of cases. In one instance it was demonstrated that a loop of cord was around the fetal neck. In one instance the sex was determined.

This work is not entirely devoid of danger but no untoward results have been seen in normal cases. It is too early to predicate the practicability of it but it is of extreme academic interest.

DR. FRANCIS C. GOLDSBOROUGH, BUFFALO, N. Y.—The roentgenologist must learn to take pictures that will be of help in making diagnoses. Dr. Matthews should emphasize the fact that a negative picture does not mean anything. I have had several cases where there were twins and the roentgenogram showed nothing. In one case the roentgenologist said the patient was not pregnant and twins were born. In another instance the patient had had two pregnancies, both babies still-born. In the third I suggested an x-ray and she had a normal delivery. In one the x-ray apparently showed two heads. I agreed with the roentgenologist that it was probably a twin pregnancy. We delivered the patient of one child and did not find the second, but we did find a mass. X-ray the next morning still showed the fetal head. The roentgenologist felt sure that I had missed one child. The one fact I want to bring out is that the shadow of two heads is not sufficient for a diagnosis. In this case we had no spinal column. In looking over the first picture that we had taken in the third pregnancy there was a little overlapping of the

head. Evidently it was that fibroid which had been calcified and which had evidently been present for a great many years.

DR. FREDERICK J. TAUSSIG, St. Louis, Mo.—I should like to call attention to the very interesting work that has been done by Jungmans in Germany in the very early diagnosis at eight weeks of pregnancy. His technic is such that by the use of a long tube and by placing the camera at right angles to the inlet plane of the pelvis, he can photograph certain objects that he can by experience recognize as fetal bones upon the plate. The interpretation of these plates apparently requires considerable experience; the bones if photographed at right angles will show no shadow, but if photographed lengthwise will show as a dot. These dots and dashes and crescents may be interpreted as fetal bones.

The remarks of Dr. Murphy make one wonder if one is justified in adopting this method of early diagnosis of pregnancy. If there can be any harm done by repeated photographs, and if there have to be rather prolonged exposures to get these little bone shadows out clearly, I think we should adopt other methods such as the diagnosis of pregnancy by the urine and other measures which are surely equally reliable with the x-ray.

In our service at the Barnes Hospital we have two x-ray photographs of abdominal pregnancies and in studying these plates I feel convinced that in a third case of this kind I would be able to make the diagnosis from the x-ray photograph alone because it showed very definitely a shadow of the uterus and the full-term fetus lying outside the limits of this uterine shadow.

DR. JOSEPH L. BAER, CHICAGO, ILL.—At the Michael Reese Hospital in the early diagnosis of pregnancy we like to use carbon dioxide pneumoperitoneum administered transabdominally. The patient is uptilted, the uterus thus being surrounded by this gaseous background and quite apart from the adjacent viscera so that the diagnosis is rendered a little more easy. The risk is practically *nil*.

In diagnosis of fetal death Dr. Arens has pointed out what Dr. Matthews has emphasized, namely, angulation of the fetal spine. The overlapping of the skull bones is by no means pathognomonic. I have a film showing marked overlapping at term and the baby was born alive.

DR. MATTHEWS (closing).—As to the matter of dosage, I think Dr. Murphy is perfectly right in sounding a warning, but remember he is talking about therapeutic dosage and we are talking about a filming dosage. The dosage we figured as safe for the fetus at any age, we cut in half, to be doubly sure, and hence I feel satisfied that the filming of a pregnancy at the twelfth to the fourteenth week and beyond is perfectly safe. Before this period there is no use filming them without insufflating the peritoneum, because the fetal bones will not cast a shadow. The cases that Dr. Murphy referred to were filmed early, at four, five, and six weeks. Dr. Murphy spoke of a case of Mongolian idiot filmed at the fourth week; such a case need not necessarily have been produced by the x-ray. Furthermore, one case does not prove very much. All that Dr. Murphy said regarding dosage is correct but it does not apply to the filming dosage. The filming dose we recommend is so small that we feel, in our experience in over 300 cases, that it will not do harm to the fetus.

The reading of the plate is very important. Naturally the more experience one has the better he can interpret them. As Dr. Goldsborough mentioned, it is often not the fault of the method but the fault of the men who are trying to execute the method.

Dr. Baer spoke of the overlapping of the bones but he did not specify that the patient was in labor. If she is in labor, and particularly if the head is in the pelvis

and there has been any moulding whatsoever you get overlapping. The history of the case and the proper interpretation of the film would keep one from making an incorrect diagnosis of dead fetus in such an instance.

5. **Fetal Malformations in Multiple Pregnancy**, by Dr. Fred L. Adair, Chicago, Ill. (For original article, see page 539, October issue.)
6. **Music in the Operating Room**, by Dr. John A. McGlinn, Philadelphia, Pa. (For original article see page 678.)

DISCUSSION

DR. JOSEPH B. DeLEE, CHICAGO, ILL.—I have had considerable experience with music as an assistant in local anesthesia. About fifteen years ago when I was converted to the use of local anesthesia for the low cervical cesarean section I used the phonograph to supply music during the operation but the intention was not so much in line with Dr. McGlinn's plan, as to convert the patients to the idea of local anesthesia and to help them see that the operation was practically painless. It did convert a large number of patients.

We found that patients preferred the string quartettes as the most soothing and most generally applicable.

DR. MCGLINN (closing).—I think one remark which was just made is very pertinent and that is that the hearing of patients is very acute while being operated upon under spinal anesthesia. I had a colleague who objected to the use of music because he said he preferred the operating room to be quiet and even though he had adopted rubber rings for his sponges, his operating room was a jumble of noises; his assistants and nurses were talking, dozens of instruments were making a noise and there were many other unnecessary noises. External noises are eliminated by the sound of music and the patient is not terrorized by this sound as she often is by other operating room noises.

7. **Obstetric Motion Picture Films**, by Dr. Joseph B. DeLee, Chicago, Illinois.
8. **The Treatment of Salpingitis by Local Injection of Turpentine**, by Dr. Herbert M. Little, Montreal, Canada. (For original article, see page 582, October issue.)

DISCUSSION

DR. ARTHUR H. CURTIS, CHICAGO, ILL.—I wish to emphasize that I continue to be a warm advocate of palliative care of patients with active tubal infection irrespective of the etiology of the infection. If we stop to contrast Dr. Little's method with that of absolute conservation in the management of acute tubal infections I believe we will find that there is not, after all, such a great difference as might appear at first glance. I surmise also that it is highly probable that the needling of the tube, which is relatively simple, may markedly diminish the amount of suffering which the patient may have. If the tubes were easily available so that it would not be necessary to open the abdomen I should be tempted to do that in many instances. I think also the rest in bed incident to recovery from the abdominal wound promotes convalescence from the active infection of the pelvis.

My belief is that the fundamental factor underlying treatment should be that the acutely infected, bacteria-laden, badly diseased pelvic tissues should be left

undisturbed, aside from making an abdominal incision. Dr. Little does this almost as much as we who believe in absolute conservatism in the care of these infections.

DR. SIDNEY A. CHALFANT, PITTSBURGH, PA.—The former treatment of acute inflammations has been largely devoted to limiting the mortality. In recent years there has been a turning to the physiologic end, to try if possible to restore function and this work of Dr. Little's is undoubtedly in that direction. We have occasionally opened an abdomen where we thought the acute condition had more thoroughly subsided than it really had and we have been compelled to close that abdomen rather than to persist with a rather dangerous operation. We have always been impressed with the fact that those patients seemed to make a very rapid recovery after that operation. Their acute condition apparently subsided more promptly than you would expect it to do. Whether opening the abdomen in these cases is a factor or not I do not know but I rather think it is. I have often wondered what became of the milder, not the most severe, acute inflammations in the days before operation? What happened to them? How many of them got well and how many were functionally well? We cannot get statistics on that point now, but I believe that there were many of them who recovered with the absolute conservatism of the time. I am still firmly impressed with the idea of complete conservatism as indicated by Simpson's work and as further carried out by Curtis.

DR. LITTLE (closing).—I might say that as far as acute cases were concerned they were operated upon only when incorrectly diagnosed. Advocacy of the injection in acute cases is for the benefit of the general surgeons, many of whom now do it when they open for a supposed appendix, having found it a perfectly safe thing to remove the pus and inject the tubes with the turpentine in oil.

Dr. Curtis also asked about operation in the acute stage. Most of the cases considered in my paper had had rest treatment for a considerable time and we assumed that the infection was more or less arrested.

Dr. Brettauer asked about the difference in cases of acute streptococcus, staphylococcus and gonorrheal infections. I do not think we have tried it in any cases of acute streptococcus infection except in the one case with ovarian abscess. Practically all were women with external evidence of old gonorrheal infection.

9. **An Histologic Study of the Perivaginal Fascia in the Nullipara**, by Dr. Byron H. Goff, New York, N. Y. (By invitation.) To be published in *Surgery, Gynecology and Obstetrics*, and in the current volume of the Society's Transactions.

10. **Granulosal Cell Tumors of Ovary and Their Relation to Postmenopausal Bleeding**, by Dr. Richard W. TeLinde, Baltimore, Md. (By invitation.) (For original article see October issue, page 552.)

11. **The Early Diagnosis of Adnexal Cancer**, by Dr. Brooke M. Ans-pach, Philadelphia, Pa. (For original article see October issue, page 571.)

DISCUSSION

DR. JAMES E. KING, BUFFALO, N. Y.—There are three clinical types of carcinoma of the ovary, the metastatic type, the malignant cystic degeneration, and finally the primary tumors, which are acknowledged to be comparatively rare.

A feature of great importance which has never been satisfactorily explained, is that these ovarian malignant growths are practically always bilateral. At the operat-

ing table the question of primary or secondary growth is often difficult to decide. Early stomach and colon growths may give rise to rapid proliferation in the ovaries and with solid tumors of the ovary such a primary focus should be sought. Secondary ovarian growths incidental to carcinoma of the uterine body are much more apt to be recognized as such. The great frequency of bilateral involvement suggests a direct lymphatic connection between the adnexa. The tumors which I have been able to study have never shown any carcinoma cells that suggested that the secondary ovary was involved by lymphatic extension through the uterine wedge. We are justified in concluding, I believe, that the involvement of the second ovary possibly comes from some retroperitoneal connection. What is true of the bilateral involvement is equally true of the tubes. I desire to refer to three cases of carcinoma of the tube which came under my care. Compared with malignant disease of the ovaries, carcinoma of the tubes is rare.

The first case, seen in September, 1922, was a woman 55 years of age, menopause occurred at 48. The April preceding her first visit she noticed a brownish watery discharge which first appeared in large quantity, to reappear as gushes at irregular intervals. On examination, which was difficult because of a fat abdomen, a large mass could be palpated on the right side. At operation a large distended tube of the right side was prolapsed into the culdesac bound by old adhesions. The tube and ovary were freed and removed. The adnexa of the left side were apparently normal except for adhesions of long standing and these were not disturbed. The uterus was small and was not removed. On opening the distended tube a quantity of brownish serous fluid escaped. Beginning about one-half inch from the cornual attachment of the tube the lumen was occupied and distended by a capillary adenocarcinoma. The real pathology was not suspected until the tube was opened. The patient lived a year and died of peritoneal metastasis.

The second patient was aged fifty-three. She complained of a watery brownish discharge. The uterus was somewhat enlarged. On Sept. 25, 1929, the uterus was curetted and no material obtained. Believing this was an atrophic endometritis, 500 milligram hours of radium were used. The discharge persisted and in November the enlarged uterus and a slightly tender mass could be made out on the right side. On Jan. 27, 1930, a laparotomy was done and on the left side a large adherent cystic tube freed and delivered. The uterus, the size of a large pear, was removed. Both tubes contained fluid and papillary adenocarcinoma. The uterus was markedly distended by a brownish serous fluid similar to that in the left tube. The uterine wall was thinned but nowhere showed grossly or histologically any malignancy. The ovaries were free of growth.

The third case was a woman forty-four years of age who complained of pain in the lower abdomen and a brownish watery discharge. There was a firm irregular tumor occupying the lower abdomen and pelvis. At operation, on the left side a large irregular adherent tumor was freed; on right side a soft tumor closely connected with the uterus was removed. On opening the growth it was found to be a papillary adenocarcinoma of the right tube, the growth having perforated the tubal wall into the broad ligament and by extension was beginning to invade the interstitial portion of the tube. The endometrium showed no involvement. The tumor on the left side was shown to be a cystic papillary adenocarcinoma of the ovary with numerous solid portions showing the same general histologic characteristics as the tube on the right side. Now the question is whether or not the ovary was primarily involved with the tube or whether the tube was secondarily involved with the ovary?

I want to emphasize that in all of these cases of tubal carcinoma the brownish discharge is a very characteristic symptom and when one finds that and the curettage shows that there is no carcinoma of the uterus, carcinoma of the tubes may be strongly suspected.

DR. JENNINGS C. LITZENBERG, MINNEAPOLIS, MINN.—The paper of Dr. TeLinde recalls to our minds the fact that the ovary has always been the battle ground of histology, centering around the histogenesis of several tissues that occur, even in the normal ovary, including the follicle, the corpus luteum, the so-called interstitial gland and the granulosa cells and their function.

Another fact that impressed me was that out of these two papers came important clinical lessons. Now in spite of the fact that the solid tumors of the adnexa constitute only 5 per cent of the tumors, nevertheless we are depressed with the unhappy results in diagnosing and treating the malignant diseases of the adnexa. I have been impressed recently with the relatively large number of cases of postmenopausal bleeding that have not turned out to be cancer of the uterus. Sometimes we need a blow in the face to bring something home to our consciousness and the blow that I got was eight consecutive diagnostic curettages done on account of postmenopausal bleeding which grossly were very suspicious of malignancy but were not cancer of the uterus. I told the husband of one of these patients that because of the large amount of curettings and their gross appearance that his wife probably had cancer of the uterus, but when the report came back it was nonmalignant. We can no longer subscribe to the statement that postmenopausal bleeding is always due to cancer. Perhaps the paper of Dr. TeLinde may lead us to the solution of this type of bleeding through further study of persistent follicles and their granulosa cells.

Both of these papers teach us pathological and clinical lessons. The clinical lesson that I get is this: that we should continue to do our diagnostic curettages but when we find they are nonmalignant we must not be satisfied, and here is where the articulation between the two papers comes in. Their observations show that when we find there is no evidence of malignancy, we must then exercise the most meticulous care in making our adnexal diagnosis. I agree with them that we may go as far as to do an exploratory operation to determine the diagnosis. I have little patience with those surgeons who make most of their diagnoses with the scalpel. However, there are cases where our diagnostic limitations are such that we must make a frankly exploratory laparotomy.

Dr. TeLinde has brought out the fact that these granulosa cell tumors are not usually histologically malignant, but he shows that these tumors may be mechanically malignant from a clinical standpoint on account of their possible great size. One of his tumors was a tiny little one which emphasizes that it may be wise in the presence of postmenopausal bleeding to open the abdomen to find even these little tumors. On the other hand, one of his cases was so large that it was regarded as malignant, mechanically at least, from its large size. So, I think we can gather from these papers that the histologic and histogenetic chapter of the ovary has not yet been finished; and clinically that when we find these hyperplastic endometria that are not malignant we must be much more careful in studying these cases from the standpoint of bimanual examination, even, sometimes, going to the extent of exploratory laparotomy.

DR. EMIL NOVAK, BALTIMORE, MD.—I have been especially interested in the frequent occurrence of hyperplasia of the endometrium in these cases of granulosa-cell carcinoma. From a physiologic standpoint it seems to me that their significance is not unimportant, because here we have a tumor made up of one constituent of the ovary, the granulosa-cell, in pure culture, as it were. In association with it we find hyperplasia of the endometrium. This, it seems to me, is excellent support of the belief held by many of us that hyperplasia of the endometrium is due to an excess of follicle stimulus, in the absence of any corpus luteum elements.

No chapter in gynecology needs illumination more than that dealing with ovarian tumors. The difficulty comes chiefly because we cannot apply the histogenetic

method of classification as we can with many other tumors. For that matter, we do not know the histogenesis of any of the tumors of the ovary, except perhaps the simple cysts, which are not genuinely neoplastic.

The granulosal tumors are a relatively small group, but even they differ quite considerably in their histologic structure, as you have seen from Dr. TeLinde's pictures. In grouping ovarian cancers we speak of cystic and solid varieties, but in subdividing these groups we are obliged to do so in a rather clumsy fashion. This applies especially to the solid type, which is subdivided into such varieties as the medullary, the alveolar, the Krukenberg, etc. In other words, special names are given merely because of rather special characteristics.

I believe that we shall find granulosa-cell carcinoma in the future more frequently than we have in the past, now that attention has been called to their existence. I was most interested in the last case reported by Dr. TeLinde. When he showed me sections from this case, I got quite excited about them, because they at once suggested a similarity to those which one may see in the ovary after pituitary implantation. Moreover, they were quite suggestive of the picture in the ovary of one of our cases of chorioepithelioma. Certainly the cells do not suggest malignancy and, in fact, they are rather large and polyhedral. On asking Dr. TeLinde about the history of this patient, he told me that she is very tall and angular, that she has for many years had an extensive growth of hair about the face and elsewhere, and that in short, she is of somewhat acromegaloid type. I wonder if the pituitary cannot be in some way involved in these cases, and whether the study of such cases may not throw some interesting light on the relation of the endocrine glands to neoplasma.

PROF. E. H. ZWEIFEL, MUNICH, GERMANY.—Dr. TeLinde has pointed out the importance of postmenopausal bleeding and the frequency of malignancy in ovarian tumors. In our literature I have found that about one-half of the ovarian tumors after the menopause which cause bleeding are malignant, including the small ones. Neumann, in 1895, showed that out of five hundred cases of postmenopausal diseases coming to the clinic, there were only three with no bleeding in the cases of cancer. That means that practically every cancer case in an old woman causes bleeding. Just the small tumors in the menopause that remain in the pelvis are typically malignant. Generally we teach the students that all growing tumors in the pelvis after the menopause are to be regarded as cancer.

I am very much impressed with the paper of Dr. Anspach on the malignant diseases of the fallopian tubes. There are about 230 cases in the literature and the prognosis is bad. Only one case has been cured; a second one died six years after the operation. These cases were operated upon in a very early stage.

The cancer developing in the fallopian tube, a hollow organ, should give a better chance for cure if the diagnosis was made early. Now the question is, is it possible to make an early diagnosis? There is a chance in about one-third of the cases. Dr. King mentioned the brownish watery discharge. We know that about one-third of the cases of fallopian tube cancers have a yellowish discharge, about the color of amber, and this discharge appears in a typical way about every fortnight or three weeks or more. After the discharge the patients say that they feel better. The discharge usually amounts to several ounces. This is absolutely characteristic for the diagnosis of cancer of the fallopian tubes and if stated in the history it is sufficient to make the diagnosis.

DR. WILLIAM P. HEALY, NEW YORK CITY.—In regard to Dr. TeLinde's report I was particularly interested in the clinical story of his cases. When the granulosal cell tumors seemed not to be malignant there was recurrent periodic menstruation without persistent bleeding after the menopause, whereas, as he mentioned in one

case, with carcinoma the patient had continual and not interval bleeding. I think that is a very important point.

When we come to the question of treatment of the cases, of course, the diagnostic curettage is our first resort when we cannot identify a tumor mass in the adnexa of a woman after the menopause. Assuming that we find a little tissue with the curette, or a great deal, what shall we do about it? Well, based on the report of this paper, since we are dealing with nonmalignant tumor cells in the ovary, I think there is every reason why we should place in the uterus a radium applicator and give the patient a reasonably large dose of radium and also a high voltage x-ray cycle. If there is a malignant tumor this treatment will certainly help protect the patient, and if not, both of the conditions mentioned will respond to radium therapy, both the endometritis and the nonmalignant ovarian lesion. Therefore, I would very definitely suggest the use of irradiation as the form of treatment in these cases where no tumor is palpable, at the time of the diagnostic curettage.

As to Dr. Anspach's paper, we have a totally different situation there and while we all regard ovarian tumors, that we can identify by their size, as a surgical proposition, we do know how frequently we are unable to completely remove the tumor mass. As Dr. Anspach emphasized, it is a quite proper procedure to use very extensive postoperative irradiation in all of these cases. The results are not bad. There are already many cases on record, where very large masses that were not surgically removed have disappeared and failed to return for at least three years since we have been using high voltage therapy.

It is quite unfair to the patients not to give them this treatment. And then we must bear in mind that there are in the ovary, as elsewhere in the body, tumors that are decidedly of the embryonal cell type that will disappear under irradiation therapy and that cannot be cured surgically. We had a case of a young girl, twenty-three years of age, where an exploratory celiotomy was done. They removed only a portion for microscopic study and referred the patient to us. Within six weeks after irradiation was started the entire tumor mass disappeared and it is now two years since irradiation.

DR. ROBERT L. DICKINSON, NEW YORK, N. Y.—As to recurrence, it seems to me that there are two approaches to cancer study that need more emphasis. One is prevention, and the other the study of recurrences in the light of the original disease. Dr. George Gray Ward suggested that a better study be made not only of the original tumors but of the recurrences and I made a study of the matter based on the Paris Institute anatomical diagrams in outline on which they graphically draw, life size, the original tumors and the location, size and progress of recurrences. Now those Paris pictures are badly proportioned. The new ones I have made record the size and location of the original growth, and particularly the location of recurrences. In those records of recurrence on the vaginal wall, why should they appear low down at such odd spots after removal of the cancer of the cervix? I am accustomed to making drawings in clinic and operating room and it is a habit that is bound to grow up to become part of our regular entries. I got the Brooklyn Hospital group so that several could make such diagrams and they have served a great purpose. One does not need to be an artist to chart a tumor on a life-size section of the body.

Another approach to cancer study was brought to my attention forcibly by a follow-up I am doing of about 700 chronic cervicitis cases to see what happens to them. It seems to me that no more important piece of work in the prevention of cancer of the cervix can be done than to drive home to every man who delivers a patient that it is his duty to see that the cervix is left healed after a delivery just as much as to see that a retroversion is replaced. We have the responsibility of retroversion nailed on to the obstetrician by the gynecologist and we can certainly

fasten neglected cervicitis on him. From the study I have made of my cervicitis cases of thirty or forty years, we can produce results in the follow-up of the chronic eroded cervixes in prevention of cancer.

DR. FRED L. ADAIR, CHICAGO, ILL.—I have had two cases of tubal carcinoma one of which was undoubtedly primary in the uterine end of the tube. This woman had postmenopausal bleeding and was curetted. We found a small uterus with a slight amount of uterine mucosa, the microscopic examination of which revealed no malignancy. I was unable to palpate the tumor at the first examination but later was able to feel the tube and she was subjected to a laparotomy but the tube was adherent and the growth had extended and involved adjacent structures. She subsequently succumbed in spite of high voltage x-ray therapy.

The other case came in with abdominal malignancy and she was later subjected to autopsy. While the tube was definitely involved it was difficult to say that it was primarily involved.

Another point which I wish to make is in reference to Dr. King's statement concerning the bilateral occurrence of adnexal tumors. I do not wish to refer extensively to the pathology of twins but there have been many cases reported of twins, in which identical affections have occurred about the same period of life.

There have been some duplicate twins with nearly identical tumors. It seems to me that it is not more difficult to explain tumors appearing synchronously in paired organs of the same individual than the occurrence of identical tumors in the entirely separated organs of duplicate twins.

DR. JOHN A. MCGLINN, PHILADELPHIA, PA.—The problem of postclimacteric bleeding is not very easy of solution. About six or seven years ago I reported before the Philadelphia Obstetrical Society 2 cases of bleeding which showed the typical hypertrophic endometrium. After the application of 1200 milligram hours of radium they continued to bleed and, fearing we had overlooked some malignancy of the endometrium, the specimens were again studied by myself and by other pathologists and malignancy eliminated. Feeling that the proper thing to do was to remove the uterus, hysterectomy was done in all of these cases, and a very careful search made to see why the bleeding continued even after the application of radium. There was no macroscopic disease of the fundus or ovary and the only histology shown in the uterus was the typical sclerotic changes of the blood vessels which occur after the application of radium. There was no evidence of any malignancy and there have been no recurrences. We are at a loss to explain why they had the postclimacteric bleeding in the first place, and why it continued after the first fairly large dose of radium.

DR. TELINDE (closing).—About a year ago I had the opportunity of making a careful histologic study of all of the cases of postmenopausal bleeding that occurred in our laboratory and I found, somewhat to my surprise, that in 40 per cent of the cases there was a benign cause. In one case of a woman of eighty-five years who was bleeding profusely I felt that there was almost certainly a carcinoma of the body of the uterus but curettage brought away a single benign endometrial polyp.

There were five cases in which we were unable to explain the cause of the bleeding satisfactorily and inasmuch as one sees in the literature reference now and then to hypertension in postmenopausal bleeding I investigated the blood pressures. The average age was sixty-two, and the average blood pressure was 148, so there was certainly no evidence of hypertension in these cases.

One case of granulosa cell tumor of the ovary reported in the literature occurred in a woman who had previously had radium therapy for uterine bleeding. This indicates to me that if radium is used without satisfactorily explaining the cause on sound pathological grounds, the patient should be carefully followed.

One of the chief advocates of laparotomy in these cases of postmenopausal bleeding without satisfactory explanation of the bleeding in the uterus is Schiffmann. He bases his views on cases which he has followed which originally presented themselves for uterine bleeding. In one of these a vaginal hysterectomy was done leaving the adnexa in situ. Later the patient returned with an inoperable carcinoma of the ovary. The only drawback to laparotomy in most of the cases is the woman's age. The patient should be gone over very carefully medically before performing a laparotomy.

DR. ANSPACH (closing).—Dr. TeLinde has just mentioned Schiffmann's report on the difficulties attending the early diagnosis of cancer of the ovary. The same situation confronts us in cancer of the tube; there are six or seven cases reported in the literature that became inoperable during the course of observation because the symptoms were not appreciated.

I am not in accord with Dr. Healy in regard to the use of irradiation, at least in the doubtful cases, unless the patient has refused operative treatment.

(To be continued in the December issue.)

Department of Book Reviews

CONDUCTED BY ROBERT T. FRANK, M.D., NEW YORK

Review of New Books

A great deal of credit is due C. C. Norris for writing this book on *Uterine Tumors*¹ for the practitioner. Since uterine myomata are the most frequent tumors occurring within the peritoneal cavity and carcinoma of the cervix is the most frequent malignant newgrowth occurring below the waistline, it is important for general practitioners to know a good deal about these and other lesions of the uterus. The author devotes chapters to cervical polyps, malignant tumors of the cervix, carcinoma of the body of the uterus, myoma uteri, malignant tumors of the body of the uterus, and tumors of the chorion. He especially emphasizes the diagnosis of these conditions and explains the tests necessary for their detection during their early stages. Major operative technic is not discussed but the author points out the most satisfactory forms of treatment for each condition. Radiation therapy is given careful consideration. It is unfortunate that the author has failed to discuss tuberculosis of the uterus which is not a rare condition. Perhaps it was omitted because it is usually secondary to tuberculosis of the fallopian tubes. However, tuberculosis of the cervix is discussed but this is frequently primary.

This book contains so much useful information that it should be carefully studied by general practitioners. However, specialists in gynecology will also profit greatly by reading it.

—J. P. Greenhill.

This (*Cancer of the Breast*²) is one of the new series of medical monographs. The author stresses the early symptoms of carcinoma of the breast. Various pathologic and clinical classifications of the disease are discussed. The processes in the dissemination of cancer of the breast are dealt with in relation to pathology, operability, and metastases. The author regards a chemical irritation as a factor in the causation of both chronic mastitis and carcinoma of the breast. He states that in breast cancer he has never noted a complete destruction of the tumor cells by roentgen rays. He feels that radium rarely offers a cure. Surgical treatment is fully handled. An excellent résumé of the subject, clearly and concisely written.

—Philip F. Williams.

This monograph (*Die Entzündlichen Erkrankungen der Weiblichen Geschlechtsorgane, Ihr Wesen, Ihre Erkennung und Behandlung*³), based on twenty years' observation, is a very complete study of the subject. While the effects of the gonococcus occupy the greater part of the book other infections are also discussed. Notable, however, is an absence of any mention of Granuloma inguinale and Trichomonas vaginale.

The author strikes a convincingly conservative note as to treatment in his first sentence and carries the motif throughout the book.

¹*Uterine Tumors.* By Charles C. Norris. Harper and Bros., New York and London, 1930.

²*Cancer of the Breast.* By William Crawford White, M.D., F.A.C.S., New York and London, 1930. Harper & Brothers.

³*Die Entzündlichen Erkrankungen der Weiblichen Geschlechtsorgane, Ihr Wesen, Ihre Erkennung und Behandlung,* von Prof. C. Bucura. Julius Springer, Wien, 1930.

Laboratory studies are described in detail. Local evidences of various infections and infestations are discussed in various chapters. An almost complete absence of illustrations is noteworthy, while a copious and up-to-date bibliography is appended.

—Philip F. Williams.

The popularity of this standard textbook for nurses (*Obstetrics for Nurses*⁴) is evidenced by the fact that it has reached nine editions within twenty-six years. It furnishes an excellent text for the education of nurses in the theory of obstetrics, a splendid manual of the technic of home and hospital maternity nursing. Use is made of strips of motion picture films of deliveries. The newborn infant, normal and abnormal, and infant feeding are fully considered. The various appendices and the Glossary thoroughly supplement the purely theoretic matter, making this an excellent manual.

—Philip F. Williams.

The most recent of this series of publications (*Methods and Problems of Medical Education*⁵) by the Rockefeller Foundation is devoted to the teaching of anatomy and histology in the medical schools of the world. Representative articles appear from Europe, North and South America, Japan, India, Australia, and New Zealand. A card is enclosed announcing the death of the former Director and Editor, Dr. Richard Mills Pearce, Jr., through whose wisdom and energy this splendid series of monographs had their inception, and whose death marks an irreparable loss to medical education on three continents.

—Philip F. Williams.

The report⁶ of the Commission on Medical Education and Related Problems in Europe reveals the fact that the obstetric teacher in the United States is not alone in his demand for more teaching hours and more hours of clinical instruction in the problems of obstetrics. Seventy-five per cent of expectant mothers call on midwives for their confinements, and 60 per cent of all deliveries in England and Wales are attended by midwives. Only 22 per cent of the trained midwives actually practice, there are 60,000 names on the midwife roll of Great Britain. This condition hampers the English medical student in his clinical teaching, for the Lying-In hospitals are full of pupil midwives who waste the clinical opportunities. The regulations of the General Medical Council require that each student attend only twenty cases which poorly fits him for his later, mostly abnormal, practice, mainly consisting of cases which the midwife is not permitted to attend. As for Germany the report states that "all students must participate in at least four deliveries. The training in obstetrics for most students is not satisfactory." Nothing is said of instruction in obstetrics in France. In Austria the student must spend 2 periods of five days each on twenty-four-hour duty in the woman's clinic and see all cases delivered. In the Netherlands the student spends six weeks on duty in the Obstetric Wards, in Sweden four months is devoted wholly and entirely to obstetrics. In Denmark a practitioner, to be recognized as an obstetric specialist, must have spent two years in an obstetric department, one of which must be as an assistant, in addition to six months in a department of gynecology as well as three months in a department of venereal diseases. There is no short cut to specialization in Denmark. A full discussion of maternity insurance in various European countries is given.

⁴*Obstetrics for Nurses*. By Joseph B. DeLee, M.D. W. B. Saunders Company, Philadelphia and London, 1930.

⁵*Methods and Problems of Medical Education* (Sixteenth Series). The Rockefeller Foundation, New York, 1930.

⁶*Medical Education and Related Problems in Europe*. Commission on Medical Education, New Haven, Conn., 1930.

The report is replete with details of Medical Education in Europe and a perusal leads one to venture the opinion that European schools are no better fitted for educating medical students in obstetrics than are most American schools.

—Philip F. Williams.

A collective presentation of studies (*University of Iowa Studies*⁷), 1927 to 1929, from the University of Iowa covers a wide range of subjects, mostly biochemistry, pharmacology, and clinical pathology. Four articles are of interest to the gynecologist and obstetrician. Dr. Plass's Simplification of Obstetric Care, a plea to eradicate the nonessential and unnecessary; Dr. Williams' Studies in Gonococcus Infection in Female Children, five per cent mercurochrome solution applied to the cervix and vagina through a small urethroscope being found most efficacious; Dr. Miller's Posture Studies in Gynecology, and Dr. Gabler's and Dr. Rosene's acid-base Balance in Pregnancy.

—Philip F. Williams.

The well-known *Handbook of Therapy*, written by O. T. Osborne and Morris Fishbein contains almost four times as many pages and almost ten times as much material as the *Formulaire Gynécologique du Praticien*,⁸ and yet the former contains only a small fraction of the number of prescriptions to be found in the latter book. The French authors have literally almost filled their book with prescriptions for every conceivable gynecologic ailment. It is true that the title of the book "Formulaire" indicates the liberal use of prescriptions, but it is inconceivable that a gynecologist should require so many different drugs. The authors must have prodigious memories or extensive card index systems. In addition to long lists of medication there are also detailed diets for such conditions as cancer of the uterus, salpingo-oophoritis, the menopause, and especially atonic constipation. The authors believe in vaginal, cervical and uterine vaccination for certain acute and chronic conditions. They consider vulvovaginitis of young girls (pp. 47-49) and vaginitis of young girls (pp. 71-73) as separate diseases. Likewise they have distinct sections for pruritus, elephantiasis, esthiomène, kraurosis, and leucoplakia of the vulva but there is no mention of granuloma inguinale. Twenty-six pages containing dozens of prescriptions are devoted to metritis, a condition which in reality is very uncommon.

The reviewer sees no necessity for a book of prescriptions devoted exclusively to gynecology, especially since at least 95 per cent of the prescriptions are either unnecessary, useless, or even harmful.

—J. P. Greenhill.

In reality, it is unnecessary to say that Gellhorn's book, *Gynecology for Nurses*,⁹ is excellent, because this author always has something useful to say and present in an interesting way. This book, which is written in a style that any nurse can readily understand, is divided into two parts. The first deals with the female genital organs in health and disease and the second with gynecologic nursing. There are twelve chapters in the first part of the book and thirteen in the second part. At the end of each chapter a list of questions is appended as an aid to teachers and students. The final chapter in the book contains a very interesting

⁷University of Iowa Studies. Collected Studies and Reports. Volume III, No. 2, Published by the University, Iowa City, Iowa.

⁸Formulaire Gynécologique du Praticien. Par. G. Jeanneney and M. Rosset-Bress and G. Doin et Cie, Paris, 1930.

⁹Gynecology for Nurses. By George Gellhorn, W. B. Saunders and Co. Philadelphia and London, 1930.

short history of gynecology. Throughout the book emphasis is placed on proper nursing care. There are abundant illustrations, all of which are instructive.

Undoubtedly this book will become one of the most popular books for nurses.

—J. P. Greenhill.

The author of this book¹⁰ probably has done more than any other pediatrician of today to make the feeding of infants a simple affair. The chaotic conditions existing fifteen or twenty years ago have now disappeared. The feeding of normal infants has ceased to be a difficult problem for the pediatrician. The author for the first time publishes his views on infant nutrition in book form and gives also a very complete summary of the work of other writers in this field. For the obstetrician it will be of particular value to read the chapters on breast feeding and on prematurity. Interesting in the latter chapter is the method of feeding premature infants on protein milk combined with buffered lactic acid solution. The results of this method seem to be very encouraging. The chapter on anhydremia, alkalosis, and acidosis is excellent. This book seems to be the best work published on the subject in the English language.

—P. J. Zentay.

This¹¹ is a compendium of pediatrics which attempts to cover the whole field. As so often happens with compendia, its value is limited and will prove of use only to a busy practitioner who has no time to read more voluminous books on the subject. The book gives a short review of the diseases of the newly born and of infant feeding that will be of some interest to obstetricians.

—P. J. Zentay.

The first half of the sixth volume of Stoeckel's *Handbuch der Gynäkologie*,¹² third edition of Veit's *Handbuch*, contains no less than 1167 pages.

Otto von Franqué describes the anatomy, histogenesis and anatomical diagnosis of uterine carcinoma in 210 pages. He insists on a division into portio, external os, and canalicular origin besides that of the body and corpus. He believes that "different biologic properties" produce endo- and exophytic (that is, surface) extension. He likewise considers portio carcinoma more frequent than authors describe. Three such cases are given in detail. All agree with him that carcinoma of the transition zone, that is, where squamous and cylindrical epithelium meet, are most frequent; whether erosions, eversion, and cervical tears, as he postulates, are really causative, has never been fully decided.

The histologic subdivisions used are now almost universally accepted. Squamous cell cancers, he divides into ripe, middle ripe, and unripe types. Exception may be taken to his statement that basal cell carcinoma does not occur in the uterus. The cylindrical types of cancer he likewise divides into ripe (adenoma malignum), middle ripe (adenocarcinoma), unripe (carcinoma simplex). The histology of each of these types is minutely gone into. Von Franqué, in my opinion, juggles somewhat with the term "precancerous" which, after all, serves little purpose in anything except clinical medicine and which has been too frequently misused.

¹⁰Infant Nutrition. By W. McKim Marriott, Professor of Pediatrics, Washington University School of Medicine, etc., etc. The C. V. Mosby Company, St. Louis, 1930.

¹¹Recent Advances in Diseases of Children. By Wilford J. Pearson and W. G. Wyllie. Second edition. With 20 plates and 34 text figures. P. Blakiston's Son & Co., Inc., Philadelphia, 1930.

¹²Handbuch der Gynaekologie. Dritte, völlig neubearbeitete und erweiterte Auflage des Handbuches der Gynäkologie von J. Veit. Herausgegeben von Dr. W. Stoeckel. Sechster Band, Erste Hälfte. J. F. Bergmann, München, 1930.

Robert Meyer, in the course of the next 630 pages, deals with the pathology of connective tissue and mixed tumors of the uterus.

In connection with myoma uteri, a complete atlas of histology can be found but nothing new has developed. In the etiology he believes that the study of Constitution will help. References will be found in the text leading to the 99 myomas of the portio, which are on record. The details of all varieties of myomas are given. Variations, degeneration, histology are recorded at great length. Meyer considers no hormonal stimulus necessary. The ablation of the ovaries produces atrophy of the uterus and the uterine vessels which consequently affect the fibroids by merely secondarily affecting their nutrition.

Fibroma of the uterus is extremely rare, as are angiomas and lymphangiomas.

More than 300 pages are devoted to adenomyosis and endometriosis in all locations. All the theories, both abandoned and current, are discussed.

Finally he describes sarcoma of the uterus and also mixed tumors.

H. Hinselmann discusses the etiology, symptoms, and treatment of uterine carcinoma. The statistical phases are thoroughly dealt with. He lauds Schiller's colposcopy. His chapter is short, concise, and informative, but contains nothing new.

Robert Meyer then takes up the pathology of hydatid mole and chorionepithelioma. In his discussion he emphasizes the hormonal factors, quoting the well-known cases of de Snoo. In this patient all the hormonal findings of pregnancy were noted, although complete hysterectomy had been performed for chorionepithelioma of the fallopian tube, and in her the sole cause for the presence of a large amount of female sex hormone could be ascribed to the trophoblastic metastases. The relation between lutein cystic ovaries and hypophysis are emphasized.

Hinselmann has the concluding chapter on the etiology, symptomology, and diagnosis of chorionepithelioma.

This volume should be in the library of every gynecologist.

—Robert T. Frank.

Volume IV of the *Ergebnisse der medizinischen Strahlenforschung*¹³ has appeared. It contains much of interest to the gynecologist. Of especial importance in our field is the chapter by W. Lahm on the biologic basis of the healing of carcinoma. He emphasizes that carcinoma must be looked at both as a local and a general systemic disease. Cancer tissue contains no toxic substances; however, the greatly increased metabolism of the cancerous area can produce symptoms. He is a firm believer in a local predisposition as well as a general systemic disturbance. Radiotherapy produces local cytolysis as well as a re-establishment of local refractory condition.

H. R. Schmidt takes up the question of the histology of cancer of the uterus in relation to radiotherapy. He emphasizes that adenocarcinoma can be cured and that like squamous cancer, the more anaplastic the tumor is, the more radio sensitiveness is noted. He accepts a malignancy index, using that of Schmitz; if above 31, the prognosis is very poor. In an index of 10 to 20, 60 per cent of cures have been noted; 21 to 25, 40 per cent of cures; 26 to 30, 25 per cent of cures.

K. Scheele deals with the radiography of the upper urinary tract, with especial reference to its aid in the diagnosis of abdominal tumors. The technics employed include pyelography, perirenal pneumography and pneumoperitoneum. Diagnosis by means of uroselectan has not yet been included in the discussion.

¹³*Ergebnisse der medizinischen Strahlenforschung (Roentgendiagnostik, Roentgen-, Radium- und Lichttherapie)*. Herausgegeben von H. Holfelder, Frankfurt am Main.; H. Holthusen, Hamburg; O. Jüngling, Stuttgart; H. Martius, Göttingen; H. R. Schinz, Zürich. Band IV. Verlag von Georg Thieme, Leipzig, 1930.

A. Adam discusses ultraviolet light and Vitamin D, especially in connection with rachitis. Among the subjects are the sources of the absorption of the rays, effect on the basal metabolism, researches on Vitamin D, and the clinical findings based on these investigations.

P. Keller deals with the protective action of pigment against light. L. Schall describes light erythema including the sources, the reaction of the skin, and the individual variations. M. Lüdin describes the changes in form and position of the stomach due to extragastric lesions.

H. Meyer and W. Schmidt describe "the operative stomach" that is, the x-ray changes noted after various gastric operations, the various operations being dealt with in detail.

E. Lüdecke discusses diathermy in its application to neck and nose diseases, as well as to otology.

From this review it can readily be noted that this volume is of great importance and value.

—Robert T. Frank.

Item

American Board of Obstetrics and Gynecology, Inc.

The American Board of Obstetrics and Gynecology, composed of nine members and examiners elected by the American Association of Obstetricians, Gynecologists, and Abdominal Surgeons, the American Gynecological Society, and the Section on Obstetrics, Gynecology, and Abdominal Surgery of the American Medical Association, was formally organized in Niagara Falls, September 16, 1930. The Board will grant certificates indicating proficiency and specialization in obstetrics or gynecology, or both, to those who comply with its requirements.

The Board is now prepared to receive applications from experienced and qualified obstetricians and gynecologists.

This Board has been in the process of organization since 1927. It is hoped and expected that its Certificate will have considerable weight in the minds of hospital trustees and other laymen as well as in many important medical circles whenever a question arises as to an individual's special ability in obstetrics and gynecology.

Detailed information and application blanks may be secured from Dr. Paul Titus, Secretary, 1015 Highland Building, Pittsburgh, Penna.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Selected Abstracts

Ectopic Pregnancy

Garfunkel, P.: Extrauterine Pregnancy, in the Gynecological Clinic of the State Hospital in Rostow. *Monatschr. f. Geburtsh. u. Gynäk.* 77: 233, 1927.

From 1911 to 1923 the average incidence of ectopic pregnancy among all the hospital cases was 2.6 per cent. During the last sixteen years 176 cases of extrauterine pregnancy were observed in the Rostow clinic and in the majority of cases the etiology was a previous inflammation which produced changes in the tubes and in the neighboring tissues. Because of this, the author advises inspection of the opposite tube during all operations for ectopic pregnancy. If the nongravid tube appears diseased it should be removed or repaired in such a way that a pregnancy cannot occur in it. In all doubtful cases of extrauterine pregnancy, a pelvic puncture should be performed. If blood is obtained, an operation should follow within twenty-four hours to prevent the possibility of an infection. Regularity in the menses does not disprove the presence of an ectopic gestation.

J. P. GREENHILL.

Möller, F.: Symptomatology and Diagnosis of Extrauterine Pregnancy. *Acta obst. et gynec. Scandinav.* 6: 279, 1927.

Möller reviewed 190 cases of ectopic pregnancy and found that the average age, as compared with that of intrauterine pregnancies, was high, namely, from 30 to 35 years. The largest number of extrauterine pregnancies occurred in the secundiparas. Amenorrhea occurred in only 56.3 per cent of the cases and external bleeding in 91 per cent. The nature of this bleeding, however, often makes it difficult to differentiate it from menstruation. Abdominal pain occurred in 93.7 per cent and in 16.8 per cent of these patients it was not acute. In most cases the pain occurred before the hemorrhage. The acute pain occurred mostly in the cases of rupture, but also to a large extent in the cases of tubal abortion. Only 44.2 per cent of the patients showed symptoms of collapse. Of 166 cases where the temperature was known, it was subfebrile in 56 per cent. The most reliable information was afforded by bimanual palpation.

J. P. GREENHILL.

Beckers: Diagnosis, Pathology and Frequency of Extrauterine Pregnancy. *Progrès méd.* No. 28, page 944, 1928.

Menstrual disturbances, abdominal pain, and tumor formation at one side of the uterus constitute the triad of symptoms on which the diagnosis of extrauterine pregnancy may be made. However, the differential diagnosis between this condition and a cornual pregnancy or pregnancy in one horn of a bicornuate uterus is often

difficult. In the former condition the tumor is often apt to be behind the uterus. Again in some cases it is possible to palpate the round ligament which in ectopic pregnancy will be found in front of the enlarged tube. However, neither of these methods of differential diagnosis is satisfactory. Beckers points out that the cornual or bicornuate pregnancy being within the uterus is covered by a definite muscle layer whereas in the tubal pregnancy because of the deficiency of the muscular layer of the tube this muscular coating is negligible. For this reason the consistency of a tubal pregnancy will always be soft while consecutive examinations in a cornual pregnancy will sometimes give a soft tumor and a day or two later a hard tumor due to the muscular contraction of the uterus.

Again, where the tubal pregnancy has undergone rupture, aside from the classical symptoms of shock, severe pain, hemorrhage, etc., Beckers describes a generalized pain often referred to the thorax, sternum or interscapular regions. This pain he attributes to peritoneal irritation by the blood.

The causes of tubal obstruction are innumerable. An interesting case where accessory adrenal glands located in the broad ligament was the cause of the tubal compression is cited. Probably, because of the greater frequency of salpingitis, this condition results more frequently in extrauterine pregnancy than any other.

The claim that the frequency of extrauterine pregnancy is increasing is probably due to the more exact methods of diagnosis than to any actual increase in the disease. It is impossible to arrive at any definite reliable figures as to its frequency because of the fact that undoubtedly so many cases of tubal abortion with spontaneous cure occur.

THEODORE W. ADAMS.

Iwata, M.: The Morphology of the Human Fallopian Tube. *Monatschr. f. Geburtsh. u. Gynäk.* 81: 283, 1929.

The epithelium of the fallopian tube consists of a single layer of both ciliated and nonciliated cells. The latter cells have a secretory function. Some individuals believe that during menstruation there is not only uterine bleeding but also tubal. This is not a universal opinion, however, but all are agreed that during menstruation, histologic changes take place in the tubal epithelium. The author examined 38 tubes which were removed at different intervals in the menstrual cycle and he found at the ampullary end distinct cyclic changes between two menstrual periods. These changes manifested themselves as alterations in the form of the epithelial cells and in the appearance of a secretion. Although the amount of glycogen in the tube is far less than in the uterus it was most abundant in the tube during the premenstrual period and was entirely absent during menstruation and immediately after the menses. No changes in the muscle wall were observed but there was an increase in the mast-cells in the muscular layer chiefly before and during the menstrual flow. The author was also able to determine definite menstruation and pregnancy sclerosis in the blood vessels of the tube such as exists in the uterus and ovaries.

J. P. GREENHILL.

Klein, S. M.: The Value of the Amidopyridine Test for the Detection of Internal Hemorrhage in the Diagnosis of Ruptured Tubal Pregnancy. *Arch. f. Gynäk.* 135: 256, 1928.

In 1918, Thevenon and Rolland devised the amidopyridine test for the detection of internal hemorrhage. The test is a very simple one and can be done at the bedside. Eight drops of 50 per cent acetic acid and eight drops of 5 per cent alcoholic solution of amidopyridine and five drops of hydrogen peroxide are mixed together.

To this mixture, five cubic centimeters of urine are added and the presence of even the most minute quantities of blood will produce a violet color in less than fifteen minutes. If no blood is present the mixture remains colorless.

Klein tried this test in 68 patients suffering from gynecologic diseases and during normal menses. In ovarian apoplexy and during normal menstruation, the test was 100 per cent positive. In ruptured ectopic pregnancy it was positive in 90 per cent. In all other gynecologic conditions the test was negative.

RALPH A. REIS.

Moritz, Alan R., and Douglass, Marion: A Study of Uterine and Tubal Decidual Reaction in Tubal Pregnancy. *Surg. Gynec. Obst.* 47: 785, 1928.

Uterine decidua was found in only 8 of 53 cases of proved tubal pregnancy in which histologic examination of the endometrium was made. In cases of tubal pregnancy (a) uterine decidua may be, but is not constantly, formed; (b) decidua is constantly found at the implantation site, if the chorionic villi are intact. Vaginal bleeding is a common symptom of ectopic pregnancy and is not necessarily associated with the death of the fetus.

WM. C. HENSKE.

Roth, H.: Abdominal Hemorrhage of Ovarian Origin. *Gynec. et Obst.* 16: 464, 1927.

The rupture of a follicle may occasionally be the basis of intraperitoneal hemorrhage which will simulate closely that of ruptured ectopic pregnancy. Hemorrhages of ovarian origin should be considered as primary, due to constitutional or blood diseases, infections, etc., and secondary, developing as a result of affections of the ovary itself, such as tumors, inflammation, twisted pedicle, etc. Follicular hemorrhage may occur from either atretic or ovulating follicles or from the corpus luteum. Variations in the intraperitoneal pressure, especially where it is negative, may account for bleeding from fragile surfaces. If one considers how easily bleeding can be provoked by aspiration in the nonparenchymatous organs (buccal mucosa, etc.), such a mechanism is more comprehensible. The menstrual cycle, which affects the vascularization of the entire pelvis and occasionally accounts for vicarious bleeding, may underly a tendency to ovarian bleeding.

A differential diagnosis between appendicitis and bleeding from corpus luteum may be very important but should not ordinarily be difficult. A needle per vaginam may elucidate the diagnosis.

GOODRICH C. SCHAUFFLER.

Wilson, R. K.: Ovarian Hemorrhage Simulating Acute Appendicitis. A Series of Seven Cases. *Lancet* 1: 1221, 1928.

The writer doubts the possibility of a positive diagnosis being made of this condition. The sudden onset of pain, tenderness on pressure in the right iliac fossa, and an elevated pulse rate, suggest appendicitis. Ectopic pregnancy and salpingitis are not so likely to be diagnosed. Of the cases reported, he adds, the correct diagnosis was not made in any.

No consistent etiologic factor has been found. Trauma was present most frequently. Two clinical types are discussed. The first comprises the milder degrees, giving signs of peritoneal irritation and indistinguishable from acute appendicitis. The second group is fulminating and presents the picture of severe intraperitoneal hemorrhage.

Because the end-result may be fatal, operation is recommended for both groups.

H. C. HESSELTINE.

Simon, L.: Spontaneous Ovarian Hemorrhage with Acute Abdominal Symptoms. *Acta obst. et gynec. Scandinav.* 8: Supplement, 1928.

A study of the author's 14 cases and 81 cases in the literature have convinced him that extensive intraperitoneal ovarian hemorrhage can occur without the simultaneous presence of pregnancy. The symptoms produced by such hemorrhages may resemble those of appendicitis or extrauterine pregnancy. The ovaries which are the seat of the hemorrhage have a characteristic anatomic structure. The cause of the bleeding is some disturbance in the function of the ovary, especially the emptying of the follicles. An increased amount of connective tissue, experimentally produced in the tunica albuginea of the ovary of rabbits may result in nonrupture of the follicles at the time of ovulation, hence the ova are retained instead of being cast off. The follicles become cystic and atretic, and form cystic corpora lutea. Bleeding then occurs in these cysts. Most of these changes are found to be characteristic of the bleeding ovaries of women.

These cases of ovarian hemorrhage take place in women from thirteen to forty-five years of age and occur in virgins as well as multiparas. The menstrual periods are usually regular. The symptoms are usually acute and begin in the third and fourth quarter of the menstrual cycle. There is almost never any vaginal bleeding.

J. P. GREENHILL.

Corlette, C. E.: Dangerous Hemorrhage from Corpus Luteum in an Apparently Normal Ovary. *Med. J. Australia* 1: 15, 1928.

The author reports a case of intra-abdominal hemorrhage in an apparently normal unmarried individual at the age of thirty-eight. The last normal period was 29 days before the onset of the symptoms. The symptoms began with a sudden pain referred to the rectum which later spread to the entire abdomen and right shoulder region. The clinical picture was typical of shock from intra-abdominal hemorrhage.

At the operation, which was performed immediately, 1200 c.c. of blood was removed. All of the abdominal and pelvic viscera were normal and free from evidence of bleeding excepting that some dark blood could be expressed through a small aperture in the right ovary. The convalescence was uneventful.

The writer concludes by stating that in all probabilities the hemorrhage was from a corpus luteum in a normal ovary, even though it was near a menstrual period.

H. C. HESSELTINE.

Sellheim, H.: The Treatment of Tubal Pregnancy With Retention of the Tube. *Med. Klin.* 24: 1736, 1928.

The treatment of ectopic pregnancy has gradually become more and more conservative. Previously the ovary was always removed with the tube but during the last few years the tube alone has been removed. The author now advocates saving the affected tube in cases where subsequent pregnancies are highly desirable. He outlines and illustrates two procedures whereby conservative surgery may be employed to save a tube which is the seat of a pregnancy. In the first operation, after removal of the product of conception, the wound is closed over a sound by means of interrupted oblique and vertical sutures. In the second operation, after removing the ovum, the tube is incised from the fimbriated end to the site of the pregnancy, the excessive amount of hypertrophic tubal tissue is removed and the lumen is then closed with interrupted vertical sutures over a probe.

J. P. GREENHILL.

Hasselblatt, R.: Repeated Pregnancy in the Same Tube. Report of Two Cases. *Acta obst. et gynec. Scandinav.* 6: 211, 1927.

The author reports two new cases of recurrent tubal pregnancy on the same side. In one of them an incomplete salpingectomy had been done at the first operation and only the middle third of the tube had been removed. After having passed through a spontaneous labor following this operation the patient was again operated upon for tubal pregnancy on the same side. The pregnancy was found in the remaining lateral part of the tube and the whole tube was removed.

The second patient was operated upon for tubal rupture and in this case also, an incomplete salpingectomy was performed. Only the proximal portion of the tube, 3 cm. long, was left. Two and a half years later a pregnancy developed in this tubal stump and at operation the whole tube was removed.

Such recurrences of tubal pregnancy on the same side occur very rarely. In addition to his own two cases, the author collected nineteen cases, three of which had not previously been published as cases of recurrent tubal pregnancy. The occurrence of tubal pregnancies in the same patient three times has been noted only twice. The recurrence of tubal pregnancies in the same tube is due to faulty operative technic and to a disturbed process of healing. It is essential, in the author's opinion, always to do a complete salpingectomy with a wedge-shaped excision of the uterine cornua and to cover carefully the wound with peritoneum.

The author also critically examined twenty-three cases published as recurrent tubal pregnancy on the same side, but he does not consider them authentic on account of unsatisfactory proof or insufficient data. He emphasizes that the diagnosis of recurrent tubal pregnancy in the same tube can be made only where operation has established absolute proof of the gravid state or where, at least, an operation in a subsequent pregnancy or subsequent postmortem examination makes the connection between the two pregnancies clear in every detail.

J. P. GREENHILL.

Schockaert: A Case of Bilateral Tubal Pregnancy. *Bruxelles med.* 8: 833, 1928.

Cheval was able to find but sixteen authentic cases of bilateral tubal pregnancy existing in literature. To this number Schockaert adds the case of a woman who had skipped two menstrual periods, at which time she had a painless bloody discharge for nine days. Two days later she developed a severe pain in the lower abdomen, which lasted but a few hours. A month later the pain returned, and a diagnosis of ruptured ectopic pregnancy was made. On opening the abdomen, which was filled with liquid blood and old clots Schockaert found that the left tube had ruptured. The right tube was the seat of a spherical nut-sized mass which ruptured spontaneously while the clots were being removed from the culdesac. Both tubes and one ovary were removed and subsequent microscopic examination showed that each tube was the seat of an extrauterine pregnancy. The author calls attention to the fact that following the death of the first fetus the uterine bleeding did not continue as usual and feels that the uterine mucosa was probably prevented from being cast off by the progressing pregnancy in the unruptured tube.

THEODORE W. ADAMS.

Jordan, H. E., and Meade, R. H.: A Case of Twin Tubal Pregnancy. *Virginia Med. Monthly* 55: 605, 1928.

In literature there are only forty cases of twin pregnancy occurring in the tube. In the case reported the twin pregnancy was in the right tube and estimated gestation of measurement would make the time between thirty and thirty-six days.

Clinically the pregnancy was seven weeks and this would check with the histology of the chorionic villi. The smaller embryo seemed to be somewhat stunted in development. The patient had suffered for at least two years with chronic appendicitis and this raises the question as to whether the right tube were not affected so that the ova met definite impediment in their descent through the tube to the uterus.

A. C. WILLIAMSON.

Parker, E. C.: Ectopic Pregnancy. New Orleans Med. & Surg. J. 82: 89, 1929.

The author presents 2 unusual cases. The first was a triple pregnancy in a para ii, twenty-nine years of age. The symptoms consisted in missed period followed by bleeding and sudden severe pain. At operation a ruptured ectopic on the right side, and an unruptured ectopic on the left was found. The tubes were removed. On the fifth day after operation the patient also aborted a six weeks' fetus. Recovery was normal. The second patient was twenty-seven and nulliparous. Three years after having had a ruptured ectopic on the right side which was removed, she had another on the left. No pregnancies intervened between these ectopics.

FRANK SPEILMAN.

Liepmann, W.: Ectopic Pregnancy after a Supravaginal Amputation of the Uterus. Zentralbl. f. Gynäk. 51: 2479, 1927.

Supravaginal amputation of the uterus had been done on account of an intraligamentous cystadenoma, developing retroperitoneally and closely attached to the uterus. For two years the patient remained perfectly well, menstruation had ceased, when severe pains in the lower abdomen forced her to consult a physician, who felt a tumor of grapefruit size directly above the cervical stump. The diagnosis of a fibroid developing out of the stump was made. Another physician believed the tumor to be a hematoma. Finally the culdesac was punctured and blood found. At the hospital the culdesac was opened and drained (instead of opening the abdomen from above). Transfusions, etc., were of no avail, the patient died soon after. Autopsy revealed 2 to 3 quarts of blood in the abdominal cavity and a tubal pregnancy in the right tube. The rupture had occurred at the lowest pole of the tumor, the fetus was 1 to 2 cm. long.

GROVER LIESE.

Keevill, A. J.: Full-time Abdominal Pregnancy, Prolonged Suppuration: Recovery. British M. J. May 12, 1928, p. 801.

In August, 1927, an African woman, about twenty-five years old was brought to the author with the following history: About August, 1924, the patient became pregnant for the first time. In April, 1925, she had labor pains which lasted a day or two but "nothing was born." She was left with a hard swelling in the abdomen. The swelling caused very little inconvenience until August, 1926, when it became very painful, increased in size, and finally ruptured in the region of the umbilicus, discharging a quantity of foul-smelling pus. About the same time the patient noticed small fragments of bone and short pieces of hair.

Examination.—Extremely emaciated, unable to stand erect because of a large, hard, and rounded swelling in the middle of the abdomen. The swelling was discharging thin pus through a small opening about 1 cm. above the umbilicus. Pulse 120. Evening temperature 100° F.

Operation.—Incision was made in the midline. A fold of peritoneum was accidentally opened for about 1 cm. This was swabbed with acriflavine and closed. The cavity contained the fetal remains of an apparently full-time fetus. The cranial and several limb bones were lying loose. The brain had liquefied but the greater part of the soft parts were still recognizable. The cavity passed downward toward the left iliac fossa, and apparently opened into the pelvic colon. The cavity was emptied, irrigated with warm saline, swabbed out with acriflavine, and drained through a large rubber tube. On the second day a fecal fistula formed and discharged fecal matter for fourteen days. The patient improved and made a complete recovery.

ADAIR-LYNDE.

Frolov: Full-term Extrauterine Pregnancy with Living Child. J. akush. i. Zhensk. bolez. 39: 448, 1928.

The author was able to find in literature only 23 reports of full-term ectopic pregnancies with delivery of living babies by means of laparotomy. His patient was thirty years old, mother of 5 living children. She entered the hospital with cramping pains, about eight months after her last menstruation. A living female child, weighing 2,250 grams, was found lying between the intestines. Left adnexa were normal, uterus was freely movable, right ovary could not be discovered. There were no traces of an amniotic sac. The placenta was attached to intestines and omentum. Abdomen was completely closed.

ALEXANDER GABRIELIANZ.

Tschertok, R.: The Increase in the Incidence of Extrauterine Pregnancy and Its Relationship to Its Etiology. Monatschr. f. Geburtsh. u. Gynäk. 85: 19, 1930.

The author reviews the records of 178 cases of extrauterine pregnancy which were observed in the Kiev clinic during the years 1884-1928. Five of the patients had repeated ectopic pregnancies. During the last few years in Russia as elsewhere there has been an increase in the number of tubal pregnancies. In 23 per cent of the present series the patients had previously had attacks of salpingitis and 45.5 per cent of the patients had had miscarriages of which 17.4 per cent had been uncomplicated abortions. The chief cause of tubal pregnancy according to the author is some alteration in the fallopian tubes. The chief factor is inflammation, and during the last few years there has been a decided increase in the incidence of tubal inflammation.

J. P. GREENHILL.

Correspondence

Sept. 26, 1930.

TO THE EDITOR:

A recent number of the JOURNAL presented a description of extension teaching in obstetrics by Dr. E. D. Plass. Perhaps the following might be of interest along the same line.

An active teaching experience for the past twenty years has convinced me that any permanent improvement in the mortality and morbidity of obstetrics in this country must come from the inside, that is, the doctors must be trained to do better obstetrics than is being done at the present time. I believe this is a direct responsibility of the medical schools.

I was a member of the Advisory Committee of the Children's Bureau of the Department of Labor during the administration of the Maternity and Infancy Act when the method of extension teaching as outlined below was discussed and approved by this committee. The funds for this work were provided by the Sheppard-Towner Appropriation up to July 1, 1929. The work has seemed so successful that Miss Grace Abbott, Chief of the Bureau, was unwilling for it to be discontinued and, at the present time, it is being regularly continued under an appropriation direct from the Children's Bureau.

The plan of procedure is as follows: The work in Georgia was done under the auspices of the State Department of Health with the Children's Bureau cooperating. All contacts were made and publicity gained through the State Health Department. The approval of the President of the State Medical Association of Georgia was obtained. The proposition was put up to each District Medical Society in Georgia, and to each County Medical Society in Florida.

A typical course of instruction is as follows:

- Monday—2-5 P.M. The fundamental principles of the mechanism and management of normal labor and the puerperium.
- Tuesday—2-5 P.M. Hyperemesis gravidarum; pre-eclamptic toxemia; eclampsia, and chronic nephritis complicating pregnancy.
- Wednesday—2-5 P.M. Puerperal sepsis.
- Thursday—2-5 P.M. The management of occiput posterior positions; breech presentation; version, and forceps.
- Friday—2-5 P.M. Management of abortions; accidental separation of the normally situated placenta, and placenta previa.

The work is abundantly illustrated by lantern slides, moving pictures, and in some places, by mannikin demonstrations. No hobbies are ridden; only the simple fundamental facts of conservative obstetrics are taught.

The work is absolutely free to the doctors and there is no expense of any kind to the community in which the work is held. Eighteen such courses have been held in Georgia. Colored physicians are invited and one special school was held for colored physicians alone. Up until the present time we have held eight such schools in Florida with about twelve more to follow.

The results are encouraging and I am glad to continue the work even at the expense of a private practice, believing that this is the way to lower more quickly maternal morbidity and mortality.

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Original Communications

A SURVEY OF CAUSATIVE FACTORS IN STERILITY

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(Professor of Gynecology, Boston University School of Medicine; Chairman of Subcommittee on Sterility, National Committee on Maternal Health)

CONCEPTION depends upon the proper functioning of a biologic mechanism so complex and delicate that it is readily thrown out of action by disturbance in any of its parts. The past twenty years have brought a better understanding of this mechanism, and of the numerous details in which it may fail. Such knowledge of the causation of sterility is naturally prerequisite to intelligent investigation and efficient treatment.

For the past three years I have had the opportunity of handling sterility on the basis of an organized group-study,¹ in collaboration with C. H. Lawrence, A. W. Rowe, and S. N. Vose. We carry out in every case an investigation which is complete according to definitely established standards. This comprises not only elaborate gynecologic and urologic examinations, but also a thorough study of both partners from the medical and endocrinologic viewpoints.

It is probably fair to assume that a group-study of this sort identifies all of the demonstrable abnormalities that are present in each case. Many of these have, of course, no relation to sterility. Many others, however, are such deviations from the normal as interfere, directly or indirectly, with the mechanism of reproduction. Analysis of the significant abnormalities has led us to modify considerably our former views on the causation of sterility. We have acquired new ideas of the general incidence and distribution of faults, and have come to feel that more importance should be attached to some items and less to others.

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

ABSOLUTE AND RELATIVE STERILITY

The present thesis will be clarified by distinguishing between two types of sterility, for which I prefer to reserve the terms absolute and relative.²

In absolute sterility the initiation of the reproductive process is, at any rate for the time being, flatly impossible. This situation results from conditions of two general sorts: those suppressing entirely the production of ova or spermatozoa, and those entirely preventing the access of spermatozoön to ovum. Such disability may be temporary only and remediable by nature or art, or it may be permanent. Absolute sterility is found in about 30 per cent of sterile matings.

In relative sterility, on the other hand, the initiation of the reproductive process is not definitely impossible, but is to some extent impeded and made difficult. Ova and spermatozoa are produced, but they may be deficient in number and subnormal in quality. The access of the male gamete to the female is not entirely prevented, but obstacles of one sort or another may be placed in the way. Thus the capacity for reproduction, still actually present, is diminished to a degree which varies within wide limits in different cases and fluctuates within narrower limits in the same case at different times.

Relative fertility should be recognized as the logical complement of relative sterility. The human being is, comparatively speaking, a poor breeder, rarely if ever attaining what might be called absolute fertility, or biologic perfection of the reproductive function. Most couples who succeed in demonstrating their fertility do so in spite of certain more or less unfavorable conditions, the nature and extent of which determine the fecundity of the mating.

There are all degrees of relative fertility, as there are of relative sterility. Together these constitute a graded scale, extending from absolute sterility on the one hand to a theoretical absolute fertility on the other. Midway in the scale is the threshold of conception, and for practical purposes a case is simply sterile or fertile according as its fertility-level falls below or above that threshold. For scientific purposes some cases are more sterile than others, just as some exceed others in fertility, since on each side of the threshold there is a wide range of divergence.

PLURALITY OF CAUSATIVE FACTORS

From the time of Aristotle logicians have recognized the pitfalls which beset all attempts to analyze causation. In medical problems, because of their complicated nature, the chances of fallacious induction are especially numerous.

In the past it has been generally assumed that the sterility of any mating is due to *a cause*, that is, to some single abnormality which

directly results in the suppression of fertility. This idea may be correct as regards absolute sterility, where a complete blockade, or a complete gametogenic failure, is obviously sufficient by itself to account for the trouble. In relative sterility, however, the problem of causation is not so easily resolved.

The more scientific modern study of sterility has identified a large number of conditions, genital and constitutional, which exert an obvious depressing influence upon the fertility-level without definitely removing all chances of conception. To call an item of this sort a cause of sterility, without qualification, is somewhat illogical, since every one of the conditions in question may be found in individuals of proved fertility. Hence I prefer the term causative factor, signifying simply a factor which to some extent lowers the position of the individual in the graded scale of relative fertility-sterility.

Whether a mating proves relatively sterile or relatively fertile depends solely and entirely upon whether or not the sum-total of such adverse factors in the two partners is enough to depress the fertility of the mating below the threshold of conception. On the same principle, the cure of relative sterility requires the removal of at least a sufficient part of that sum-total so that the fertility-level may rise above the threshold.

The complete investigation of sterility demonstrates in no uncertain way that the etiologic sum-total is made up of multiple factors. In no case have we found less than two causative factors; some cases have shown as many as 8; the average is between four and five factors per case. Table I presents the nature and distribution of these factors in a series of 25 typical sterile matings.

Multiple causative factors are found in cases of absolute sterility no less than in those which are relative only. The special feature of the absolute case is the predominant importance which must be assigned to some one factor. If that factor is removed, the case is then transferred to the relatively sterile or relatively fertile group.

A clear idea of the multiple nature of causation is, in my opinion, prerequisite to all practical understanding of the problem of sterility. Procedure on any other basis leads to incomplete diagnosis and inadequate treatment, as well as to the compilation of data of indeterminate value.

DISTRIBUTION OF RESPONSIBILITY BETWEEN MALE AND FEMALE

In the past no aspect of the problem of sterility has been subject to more extensive misunderstanding than has the division of responsibility between the two sexes. Generally speaking, the male has received far less than his proper share of blame. The more recent views assign to the husband responsibility for 40 to 50 per cent of

TABLE I. AN ANALYSIS OF CAUSATIVE FACTORS IN TWENTY-FIVE COMPLETELY STUDIED CASES OF STERILITY (SERIES B)

| CASE NUMBER | MALE FAULTS | | FEMALE FAULTS | |
|-------------|---|--|--|--|
| | CONSTITUTIONAL FACTORS | LOCAL FACTORS | CONSTITUTIONAL FACTORS | LOCAL FACTORS |
| B1-SS27 | | (Chronic prostatovesiculitis)* | | Hypoplasia Viscosity of endocervical secretions Tubal obstruction ✓ |
| B2-SS28 | | | Hemoglobinemia (Protein starvation) | Retroversion of uterus with anteversion of cervix Tubal obstruction ✓ |
| B3-SS29 | Pituitary dysfunction (Chronic sinus infection) | | Pituitary dysfunction | Hypoplasia Tubal occlusion ✓ |
| B4-SS33 | Pituitary dysfunction | (Hypospadias) | | Hypoplasia Viscosity of endocervical secretions Tubal obstruction ✓ Cyst of left ovary |
| B5-SS34 | Pituitary dysfunction (Chronic dental infection) | (Chronic prostatovesiculitis) | Thyroid failure | Atrophy of uterus Tubal obstruction ✓ |
| B6-SS35 | | (Testicular hypoplasia) | Ovarian failure | Hypoplasia Absence of left ovary |
| B7-SS36 | Protein starvation | | Pituitary dysfunction | Tubal obstruction ✓ |
| B8-SS37 | | | | Endocervicitis and viscosity of secretions Tubal obstruction ✓ |
| B9-SS38 | Pituitary dysfunction | (Bilateral varicocele) | Ovarian failure | Viscosity of endocervical secretions Tubal occlusion ✓ |
| B10-SS39 | Pituitary dysfunction | | Pituitary dysfunction (Chronic tonsillar infection) (Protein starvation) | Hypoplasia Viscosity of endocervical secretions Retroversion of uterus with anteversion of cervix Tubal occlusion ✓ |
| B11-SS40 | | (Left varicocele) | | |
| B12-SS41 | Pituitary dysfunction | Chronic prostatovesiculitis Testicular hypoplasia | Protein starvation | |
| B13-SS42 | Protein starvation | (Left varicocele) | Pituitary dysfunction | (Hypoplasia) Cysts of both ovaries |
| B14-SS43 | | | Hepatic toxemia Chronic dental and tonsillar infection Pituitary dysfunction | Hypoplasia and bicornate uterus Endocervicitis and viscosity of secretions |
| B15-SS44 | Chronic sinus infection (Pituitary dysfunction) | | Pituitary dysfunction | Endocervicitis and viscosity of secretions |

18 cases Tubal obstruction

TABLE I—CONT D

| CASE NUMBER | MALE FAULTS | | FEMALE FAULTS | |
|-------------|--|-------------------------------|--|--|
| | CONSTITUTIONAL FACTORS | LOCAL FACTORS | CONSTITUTIONAL FACTORS | LOCAL FACTORS |
| B16-SS45 | | | | (Fibromyomas) Tubal obstruction ✓ Endocervicitis Persistent corpora lutea in both ovaries |
| B17-SS46 | Protein starvation | | Chronic tonsillar infection Protein starvation Pituitary dysfunction | Hypoplasia Tubal obstruction ✓ Endocervicitis and viscosity of secretions (Retraction of uterus with anteversion of cervix) |
| B18-SS47 | Pituitary dysfunction | (Chronic prostatovesiculitis) | Thyroid failure | Tubal obstruction ✓ |
| B19-SS48 | Bilobar pituitary failure | | Pituitary dysfunction | Tubal obstruction ✓ Viscosity of endocervical secretions Bilateral ovarian cysts |
| B20-SS49 | Thyroid failure | (Left varicocele) | Protein starvation Thyroid failure | Tubal obstruction ✓ Endocervicitis and viscosity of secretions |
| B21-SS50 | (Pituitary dysfunction) | Exhaustion from sexual excess | Bilobar pituitary failure Protein starvation | Hypoplasia Tubal occlusion ✓ |
| B22-SS51 | Malnutrition Chronic dental infection | (Left varicocele) | Protein starvation | Senile atrophy Tubal occlusion ✓ |
| B23-SS52 | Protein starvation | | Protein starvation Ovarian failure | Bilateral ovarian cysts Tubal obstruction ✓ (Endocervicitis) |
| B24-SS53 | (Syphilis) | | | Hypoplasia Viscosity of endocervical secretions Cysts of right ovary |
| B25-SS54 | Endocrinopathy, focus undetermined | | Pituitary dysfunction | Hypoplasia Tubal occlusion ✓ Endocervicitis and viscosity of secretions |

*Factors enclosed in parentheses are regarded as contributory and possibly causative, either in general or in the particular cases where they are listed.

†Hypoplasia of the female pelvic organs has its origin in a constitutional depression at puberty, but is considered to be a local condition as encountered in adult years.

‡The term tubal obstruction denotes one or another type of partial blocking, distinguished from complete impermeability or occlusion.

§The term pituitary dysfunction is here used to denote underactivity of the anterior lobe of the gland with overactivity of the posterior lobe.

||Ovarian failure, meaning a deficiency of internal secretion, is listed as a constitutional rather than a local condition.

sterile marriages. Such estimates are necessarily unreliable, for they are based upon the erroneous idea that sterility is due to *a cause* which can be definitely allocated to one or the other partner.

Since actually sterility is in most cases the result of a summation or totality of several causative factors, the assessment of individual responsibility becomes a complex matter. As indicated in Table II, about one-third of all factors are on the side of the male and two-thirds on that of the female. The total responsibility of wives thus outweighs that of husbands. However, the distribution of factors is such that in the great majority of matings some degree of responsibility exists on both sides. Among the 25 cases presented in Table I are found only four guiltless husbands, and not one guiltless wife. In general, less than 10 per cent of clinical cases of sterility show a complete absence of male faults, while less than 5 per cent show complete absence of faults in the female.

Except in the presence of an absolute cause of sterility, it is practically impossible to say whether or not the level of fertility-sterility in one individual is such as will allow procreation. High relative fertility in one partner may overcome a considerable degree of relative sterility in the other; or conversely, moderate relative fertility may be counteracted by marked relative sterility. No explanation more subtle than this need be sought to account for the cases of so-called idiopathic or functional sterility, or mismating.

Such phrases as "male sterility" or "sterility in women" are definitely misleading. That there are sterile men and sterile women no one doubts. In more than 90 per cent of cases, however, sterility is an affair, not of the man alone or of the woman alone, but of the mating.

MALE CONSTITUTIONAL FACTORS

One of the most noteworthy details of modern progress in sterility is an adequate appreciation of the rôle played by constitutional fac-

TABLE II. DISTRIBUTION OF CAUSATIVE FACTORS IN 50 CASES OF STERILITY

| | |
|--|-------------------------------------|
| Male factors | 72 = constitutional 44 + local 28 |
| Female factors | 160 = constitutional 46 + local 114 |
| Total factors | 232 = constitutional 90 + local 142 |
| Average number of factors per case = 4.6 | |

tors.³ It is now recognized that a considerable number of states, generally depressing and debilitating in nature, may reflect themselves in lowered fertility of the sex-cells.

This comparatively new idea is well supported by evidence from three sources. First, both animal-breeders and biologists are able to offer data from experiments made under controlled conditions. Sec-

ond, in human beings laboratory measurements of the vital-functional level indicate a definite metabolic depression when constitutional states of the sort under discussion are present. Third, accurate quantitative evaluation of the semen shows in most of such cases a considerable subnormality, which commonly corrects itself when the constitutional fault is eliminated.

As can be seen in Table II, constitutional faults in the two partners constitute more than one-third of all the causative factors of sterility. On the male side constitutional faults outnumber local faults, and in our opinion greatly exceed them in importance. Indeed, we now believe that the cause of oligospermia and necrospermia is usually to be found outside of the genital tract.

Table III shows the incidence of male constitutional factors in fifty cases of sterility. Omitting lues in one case, the remaining 43 factors fall into three well-defined groups: 24 endocrinopathies, 9 focal infections, and 10 imbalances of nutrition.

Among the endocrine disorders pituitary disturbances are conspicuously in the majority. The thyroid failures constitute a small but

TABLE III. INCIDENCE OF MALE CONSTITUTIONAL FACTORS IN 50 CASES OF STERILITY

| | |
|---------------------------------------|------------|
| Pituitary dysfunction | 16 cases |
| Bilobar pituitary failure | 2 cases |
| Thyroid failure | 5 cases |
| Endocrinopathy, focus undetermined | 1 case |
| Chronic tonsillar infection | 4 cases |
| Chronic sinus infection | 2 cases |
| Chronic sinus and tonsillar infection | 1 case |
| Chronic dental infection | 2 cases |
| Syphilis | 1 case |
| Protein starvation | 8 cases |
| Malnutrition | 2 cases |
| Total | 44 factors |

important minority. It will be noted that endocrine failures of the testicle have not been identified in our cases. Rowe's objective methods of endocrinologic diagnosis^{4, 5} indicate that the human male gonad exerts little or no endocrine influence after puberty.

Chronic focal infections must be recognized as potential causative factors in sterility. There is now an abundance of evidence to show that such conditions may depress the metabolic level to an extent which results in deficient spermatogenesis.

Among the dietary notions prevalent today is an idea that too much meat is harmful. In consequence a surprising number of people, especially of the well-to-do classes, show a negative nitrogen balance, their protein intake being below the maintenance-level. Protein starvation is, we believe, the chief nutritional error militating against fertility. Other faults of nutrition appear relatively unimportant.

A deficiency of vitamins or of mineral salts occurs rarely if ever in the ordinary mixed human diet. An excess in the total quantity of food, with resultant obesity, is not a cause of sterility, although sterility and obesity are frequently associated as simultaneous results of the same underlying subnormality of metabolic function.

MALE LOCAL FACTORS

The male partners to sterile matings show a remarkably low incidence of local genital abnormalities. Only 28 such conditions were demonstrable among a total of 232 causative factors in fifty cases.

Lesions of the testicles and epididymides may certainly occasion sterility. These comprise 8 of the 28 male local factors, as is shown in Table IV. The remaining twenty abnormalities, while not negligible, are probably not to be reckoned as major obstacles to fertility.

TABLE IV. INCIDENCE OF MALE LOCAL FACTORS IN 50 CASES OF STERILITY

| | |
|-------------------------------|------------|
| Old orchitis | 2 cases |
| Absence of one testicle | 1 case |
| Undescended testicle | 1 case |
| Testicular hypoplasia | 2 cases |
| Exhaustion from sexual excess | 1 case |
| Bilateral epididymidal block | 1 case |
| Varicocele | 6 cases |
| Chronic prostatovesiculitis | 11 cases |
| Stricture | 1 case |
| Hypospadias | 1 case |
| Premature ejaculation | 1 case |
| Total | 28 factors |

In particular we feel that prostatovesiculitis, the pathologic condition most frequently encountered, is a causative factor of sterility of much less importance than the prevalent opinion would indicate. Vose has evidence to show that the abnormal secretions in chronic prostatovesiculitis do relatively little direct harm to spermatozoa which have left the testicles. He believes, however, that the toxins elaborated by these chronic infections, like toxins produced by chronic focal infections elsewhere, may reach the testicles through the blood stream and depress the spermatogenic function.

FEMALE CONSTITUTIONAL FACTORS

In the female partners to sterile matings the incidence of constitutional faults approximately parallels their incidence in the males. Thus the 46 such factors listed in Table V include 26 endocrinopathies, 7 focal infections, and 9 imbalances of nutrition, in addition to two disorders of liver function and two blood diseases.

Here again pituitary disturbances markedly predominate among the endocrinopathies. This finding is supported by the important recent advances in knowledge of the physiology of the pituitary, which iden-

tify that gland as the "motor" of the ovary and the activator of exocrine ovarian function.

The relatively small incidence of thyroid failure and endocrine ovarian failure as causative factors in sterility should be emphasized,

TABLE V. INCIDENCE OF FEMALE CONSTITUTIONAL FACTORS IN 50 CASES OF STERILITY

| | |
|--|------------|
| Pituitary dysfunction | 12 cases |
| Bilobar pituitary failure | 4 cases |
| Thyroid failure | 5 cases |
| Ovarian failure | 5 cases |
| Chronic tonsillar infection | 6 cases |
| Chronic dental and tonsillar infection | 1 case |
| Hepatic toxemia | 2 cases |
| Protein starvation | 9 cases |
| Anemia | 1 case |
| Hemoglobinemia | 1 case |
| Total | 46 factors |

because of certain prevalent misconceptions which have led to a great deal of improper therapeutics. One such misconception is the idea that a low basal metabolic rate always connotes thyroid underfunction, and that only. As a matter of fact, subnormal metabolism is found in underfunction of any major endocrine gland, as well as in a number of nonendocrine conditions. Another prevalent error is the assumption that oögenetic failure necessarily implies endocrine ovarian failure and thus always requires ovarian organotherapy.

FEMALE LOCAL FACTORS

Any series of critical abdominopelvic examinations, even examinations of women who are functionally normal, can scarcely fail to reveal

TABLE VI. INCIDENCE OF FEMALE LOCAL FACTORS IN 50 CASES OF STERILITY

| | |
|--|-------------|
| Hypoplasia | 20 cases |
| Hypoplasia and bicornate uterus | 1 case |
| Senile atrophy | 3 cases |
| Absence of ovary | 2 cases |
| Ovarian cyst, or polycystic degeneration | 7 cases |
| Persistent corpora lutea | 1 case |
| Circumovarian adhesions | 5 cases |
| Tubal obstruction | 18 cases |
| Tubal occlusion | 10 cases |
| Fibromyoma | 3 cases |
| Retrodisplacement of uterus | 4 cases |
| Retrodisplacement and descent of uterus | 2 cases |
| Retrodisplacement of uterus with anteversion of cervix | 3 cases |
| Viscosity of endocervical secretions | 17 cases |
| Endocervicitis and viscosity of secretions | 11 cases |
| Endocervicitis | 3 cases |
| Eversion of endocervical mucosa | 1 case |
| Hypertrophy of cervix | 1 case |
| Vaginitis | 1 case |
| Vaginismus | 1 case |
| Total | 114 factors |

a considerable number of deviations from strict anatomic normality. The nicest judgment is sometimes required to evaluate properly the influence of such items upon fertility. Circumstances alter cases: a retroversion, for example, or a fibromyoma, or an endocervicitis, may contribute largely to sterility in one patient and not at all in another. Table VI lists the female pelvic lesions which were, in our opinion, causative factors of sterility in this series of 50 cases.

Leaving aside 18 miscellaneous pathologic conditions, most of them important in individual cases rather than in general, the remaining 96 lesions fall into four great groups: 21 developmental arrests, 15 mechanical interferences with ovulation, 28 defects of tubal patency, and 32 hostilities of the endocervical secretions.

The diagnosis of hypoplasia has been based upon the uterine index,⁶ a measurement more accurate than casual estimation of the familiar stigmas. The significance of this condition lies in the fact that a hypoplastic uterus connotes correspondingly hypoplastic ovaries which ovulate imperfectly, if at all.

Every effort has been made to identify the anatomic abnormalities in and around the ovaries which would interfere in a mechanical way with ovulation. The technical difficulties of ordinary examination are, however, considerable, and it is probable that the actual incidence of such faults is somewhat higher than our figures show.

We now recognize four distinct tubal conditions: normal patency, partial obstruction from organic lesions, partial obstruction from spasm, and complete occlusion. These can be accurately distinguished by a correlation of the results of gas-insufflations and those of lipiodol-injection.⁷ Among 50 women 22 showed normal patency, 18 some type of partial obstruction, and 10 complete occlusion.

Of 32 cases of endocervical hostility, the predominant trouble was simple mechanical viscosity of the secretions in 28. Infection and inflammation were of secondary importance. We have seen no indication of serologic hostility, and have accumulated considerable evidence to prove that chemical hostility⁸ of the endocervical secretions plays no part in the causation of sterility.

SUMMARY AND CONCLUSIONS

1. The older idea, that the sterility of a mating is ordinarily due to some single abnormal condition, has led in the past to incomplete investigation, inadequate treatment, and generally unsatisfactory results.

2. Modern research shows that sterility is commonly due to the combined influence of multiple causative factors. Any single one of these, excepting the comparatively few absolute factors, may not be sufficient to cause sterility; all of them together depress fertility below the threshold of conception.

3. About one-third of all demonstrable causative factors are extra-genital conditions of constitutional depression, which lower the inherent fertility of the gametes. Such conditions are operative, in one or both partners, in nearly 90 per cent of sterile matings. In the male they are, in the aggregate, more important than abnormal local conditions.

4. About one-third of all demonstrable causative factors are on the male side, and two-thirds on the female side. In more than 90 per cent of clinical cases, however, there is some division of responsibility between the two partners.

5. A radical revision of older ideas of causation requires the establishment of new standards for the complete diagnostic study of the sterile mating. Complete investigation points the way to adequate treatment, which in our cases has thus far yielded a percentage of successful results more than twice as great as our average of successes obtained by former methods.

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475 COMMONWEALTH AVENUE.

Jankelewitsch: Cleidotomy on the Living Fetus. Zentralbl. f. Gynäk. 53: 1074, 1929.

"Cleidotomy" is generally understood to mean the division of the clavicle in the dead fetus. The author became interested in those cases, occurring ever so often, of large babies whose shoulder circumference is greater than the suboccipito bregmatic, and which consequently present difficulties in the delivery of the shoulders. He was further stimulated by the large number of resulting paralyses in such cases. Having determined on the dead fetus that the subclavian muscle is on an average $\frac{2}{3}$ the thickness of the clavicle, and having developed his technic on 23 fetal cadavers without ever injuring the underlying vessels and nerves, he did a cleidotomy on a living fetus and achieved an easy delivery and an excellent result in an otherwise very difficult case. The clavicle was divided at its middle point. Unilateral cleidotomy reduces the shoulder circumference by $2\frac{1}{2}$ to 3 cm., bilateral 5 to 6 cm. The author contends that the thickness of the subclavian muscle, and the fact that the nerve, artery and vein lie in loose connective tissue, practically eliminates injury to vessels and nerve. With the exception that the clavicular fracture is a compound one, and therefore slower of healing, the results are quite comparable with traumatic fractures of the clavicle in the newborn, the prognosis of which is uniformly good. He has developed special scissors with which he claims it is impossible to injure any vital parts.

WILLIAM F. MENGERT.

A STUDY OF THE EFFECT OF ACRIFLAVINE GIVEN INTRAVENOUSLY ON EXPERIMENTAL UTERINE INFECTION IN THE DOG

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IN A PREVIOUS study¹ the author demonstrated that the dog's uterus may eliminate certain antiseptic dyes, namely, pyridium, mercurochrome, and acriflavine, but apparently does not eliminate gentian violet and methylene blue. Unpublished observations by the author indicate that the human uterus may also eliminate mercurochrome and acriflavine.

While it is true that the dyes used have a marked antiseptic action in vitro, it must be remembered that factors are present in vivo which do not exist in the test tube. Therefore, one must be cautious in estimating the practical therapeutic value of a drug from its apparent value in a test tube. Regardless of the antiseptic power of the dye as shown by in vitro experiments, two questions must be answered before one can use the dye rationally as an antiseptic in the intravenous treatment of local infections of the female genital tract. The first question, "Can the uterus eliminate antiseptic dye?" has been answered in the previous study. The second question is: "Can the uterus in the presence of an infection eliminate the dye employed in sufficient concentration to inhibit the progress of that infection?"

In answer to the second question clinical reports are variable, some authors favoring, others condemning intravenous therapy. These differences of opinion may be due (1) to difficulty in prognosis, for one can say in a case recovering after therapy that the recovery may have occurred without treatment, (2) to ineffectiveness of the dye in the concentration used, and (3) to the lack of definite controls.

Because we could not find a definite answer to the second question by using antiseptic dyes on human beings, we conducted experiments on dogs to ascertain the possible efficacy of intravenous therapy in the treatment of local infection of the female genital tract.

LITERATURE ON ACRIFLAVINE

Acriflavine was chosen in these experiments because of its low toxicity, because of the absence of serious reaction in ordinary dosage^{1, 2} and because it is eliminated by the uterus in the greatest concentration of any dye which we know to be eliminated by this organ.¹

There are other factors which render acriflavine desirable for intravenous use. For instance, its effectiveness in high dilutions.^{3, 4, 5, 6} According to Browning, a dilu-

tion of 1:100,000 is effective against cocci and coli.⁷ Furstenau⁴ states that a dilution of 1:50,000,000 acting for forty-eight hours on gonococci in ascitic bouillon is sufficient to kill them, the same author states that a dilution of 1:400,000 will kill gonococci in two minutes. Brownings⁸ and Bieling⁹ demonstrated that a dilution of 1:10,000 in a wound containing diphtheria will prevent death. These experiments, however, have been criticized by Dakin and Dunham¹⁰ because they were not conducted in the presence of cellular detritus and autolytic products which are present in wounds. They show that when muscle juice is added to the media, acriflavine is effective only in dilutions up to 1:3000 instead of 1:100,000. Eggerth⁵ believes that the pus cells, the autolytic products, and meat infusion in particular reduce the titer of acriflavine because they unite with a large part of the dye. This is in keeping with the work of Gay and Morrison,¹¹ who found that a concentration of 1:1600 did not sterilize a pleural cavity in streptococcus empyema in rabbits, and of Fleming,¹² who found that a dilution of 1:500 was usually unable to sterilize an equal volume of pus in twenty-four hours. Browning et al¹³ found that a concentration of 1:2000 acting for twenty-four hours was necessary to sterilize pus from an empyema cavity. Eggerth⁵ found a dilution of 1:20,000 effective in human pleuritic fluid.

This latter evidence argues against the efficacy of any intravenous dye therapy. But it is possible that the dye may reduce the virulence of the organism without killing it as shown by the work of Browning and Cohn¹³ with pneumococcal peritonitis, of Baumgarten¹⁴ with cholera, of Morgenroth¹⁵ and others with streptococci. However, Gay and Morrison¹¹ found that acriflavine had no effect on the duration of streptococcal empyema in rabbits. It is to be remembered in this connection, however, that the infections in animals seldom show the strictly localized character common in the human being.

It is also possible that a dye in high dilutions may neither kill nor attenuate organisms, but may inhibit their growth. Schnabel and Kaserowsky¹⁶ showed that streptococci grown in cultures containing acriflavine in dilution of from 1:1,000,000 to 1:10,000,000 were so affected that in the next subculture growth would be inhibited by a dilution of 1:2,000,000. Similar "sensitization" of organisms to acriflavine was demonstrated in vivo in white mice.

Another possible action of the dye is that it might increase the bacteriocidal properties of the blood. Mellanby and Zau¹⁷ and Spencer¹⁸ were unable to demonstrate an increase in the bacteriocidal power of the serum removed after intravenous injection of the dye. Becker,¹⁹ however, found that the serum had an increased power to inhibit the growth of hemolytic streptococci and *B. coli*.

A few investigators have studied the potency of acriflavine in body fluids. Four report that the dye is more potent in serum.^{4, 5, 6, 13} Drummond found that the presence of serum increased the effectiveness of the serum against coliform bacilli eighty fold. Eggerth⁵ believes this is due to the alkalinity of the serum and demonstrated an increase in the potency of the dye with an increase in the alkalinity of the media. Davis²⁰ demonstrated that acriflavine in dilutions of 1:100,000 in urine is effective against staphylococci and *B. coli* providing the urine is alkaline. In an acid urine P_H 6.0 it is almost as efficient against staphylococci, but requires a concentration of 1:7500 to be effective against *B. coli*.

The effect of other substances than serum on the potency has been studied. The action of the dye is enhanced by optichin according to Neufeld and Schiemann,²¹ but it is not affected by sodium or potassium salts or by phosphates according to Eggerth.⁵ Bock²² favors the use of glucose with rivanol (an acridine derivative). In this instance the sugar may decrease the toxicity as Redewill et al²³ has shown for glucose when injected with mereurochrome.

Intravenous injection of acriflavine causes an increase of from 50 to 100 per cent in the number of leucocytes according to three investigations.^{17, 24, 25} Stephan

reports a definite stimulation of the formation of monocytes of connective tissue origin in the presence of disease only, and that no improvement in the disease occurs when a relative and absolute increase of monocytes is absent.

Regarding the effect on phagocytosis, Fleming¹² states that a dilution of 1:8000 acting for five hours inhibits the phagocytic activity of the leucocytes. Mellanby and Zau¹⁷ report that a dilution of 1:10,000 inhibits, but that a dilution of 1:100,000 has no effect on phagocytosis. Gay and Morrison¹¹ report that smears made from pleural fluid taken from cases of experimental empyema treated with acriflavine showed no extracellular organisms but many phagocytes containing streptococci. In these experiments the concentration of acriflavine was probably 1:1600. Browning³ found that a concentration of 1:10,000 acting for twenty minutes had little effect on phagocytosis. Acriflavine then in a concentrated solution inhibits and in high dilution has no effect on phagocytosis.

The red blood cell count is reduced one-half million or less within an hour after the injection of acriflavine.²⁵ It has no direct effect on the red blood cells in vivo.^{17, 18} Fleming¹² believes acriflavine is an anticoagulant, but Mellanby and Zau¹⁷ found no effect upon the coagulation time.

Stephan²⁵ states that in all toxic disturbances of the reticuloendothelial system and in diseased conditions in which a hypofunction of the system could be demonstrated, it was possible by intravenous injection of acriflavine to overcome the functional inhibition and the structural disturbance for varying periods of time providing the degree of cell intoxication was not too great.

Except for an occasional case of salivation or of nausea, the only ill effects the author has noted in women, in whom from one to three injections were made into the same individual, were transient shortness of breath and a sense of constriction about the chest. Frequent injections of large doses will cause yellowish discoloration of the skin²⁶ and damage to the liver and kidney.¹⁷ It is claimed that the yellowish discoloration of the skin may be prevented by giving resorcin.^{27, 28}

METHODS

Our experiments were performed on female dogs. The principle of the experiment was to infect the lumen of the uterine horn and ascertain the effect of the dye on the course of the infection.

The operative procedure was conducted with aseptic precautions and ether anesthesia. The abdomen was opened and both uterine horns were ligated with double silk ligatures near the body of the uterus and at the fimbriated extremity, care being taken not to injure the blood supply to the parts. Ligation of the inoculated horn was necessary to prevent the pus from being discharged into the peritoneal cavity and the vagina. Ligation of both horns was done to control the effect of ligation of the horn per se in each animal. The bacterial culture was then introduced by means of a syringe and a needle into the lumen of the left uterine horn just distal to the ligature at the fimbria. The needle was passed under the serous covering, then diagonally through the musculature to the submucosa, then parallel to the mucosa before entering the lumen of the horn. This made a valve-like closure of the course of the needle which with slight pressure over the site of the injection effectively prevented leakage of pus into the peritoneal cavity in most of the cases. After the injection the abdomen was closed and the animals observed.

The pus in all cases was obtained from patients who were suffering from an infection with the organism obtained. Staphylococci, streptococci, mixtures of the two, and colon bacilli were used. The organisms in the pus were cultured twenty-four hours in glucose broth and the undiluted culture was injected. The amount injected in practically all cases was 1 c.c. When a smaller amount was used, sufficient culture was injected to distend the horn.

In each experiment the left uterine horn of three dogs was inoculated. Two of these animals were treated and one untreated, the untreated animal being used as a control. The operative procedure and the method of treatment were the same throughout. A different culture was employed in each experiment and the time for instituting treatment varied in each series.

Treatment was instituted in one series of experiments immediately after the operation; in the second series, twenty-four hours after the operation; and in the third series, forty-eight hours after operation. The treatment consisted of one intravenous injection of a 1 per cent aqueous solution of acriflavine. The amount injected was 1 c.c. per 10 pounds of body weight, or about 0.0025 grams per kilo. The usual dose for human beings is 0.005 to 0.010 grams per kilo.² Therefore, the amount used in the experiments is one-half to one-fourth the per kilo dose used in man.

The uteri were examined from two to four days after inoculation in the first series, and from seven to fourteen days after inoculation in the remainder of the experiments. Only gross changes were noted. These consisted of changes of color and thickness of the mucosa to variations in the size of the horns and the presence of peritubal adhesions. Cultures of the contents of the horns were made as noted in the protocols.

RESULTS

The results of three sets of experiments in Series I were strikingly positive, the effect of the dye being quite marked if injected immediately after the inoculation of the uterine horn.*

Protocols.—Experiment 1. This was a preliminary experiment to determine a suggestive dosage.

Dog A. Weight 20 pounds. One c.c. of 1 per cent aqueous solution of acriflavine was injected intravenously, after an inoculation of the uterine horns with a culture of staphylococci. Four days later the uterine horns were examined and the inoculated horn found to be four times normal size. The amount of the dye injected in this instance was too small.

Dog B. Weight 25 pounds. Two and one-half c.c. of acriflavine were injected intravenously after inoculation of the uterine horn with a culture of staphylococci. Four days later horns showed only a slight redness of the mucous membrane.

*The detailed protocols of the animal experiments may be found in the author's reprints. They cannot be included here for lack of space.

Experiment 2. Uterine horns were inoculated with a culture of staphylococci. Uteri were removed forty-eight hours after inoculation.

Dog A. Weight 30 pounds. Three c.c. acriflavine intravenously. Findings: There was some redness of the mucous membrane and a few peritubal adhesions. In this case there was some leakage at the time of operation.

Dog B. Weight 30 pounds. Three c.c. of acriflavine were injected intravenously. Findings: The uterine horns were the same on both sides. No change was detected.

Dog C. Weight 28 pounds. No intravenous injection. Findings: Inoculated horn was twice normal thickness, the mucous membrane was deeply injected.

Experiment 3. The uterine horns were inoculated with a culture of colon bacilli. The uteri were removed forty-eight hours after inoculation.

Dog A. Weight 20 pounds. Two c.c. of acriflavine were injected intravenously. Findings: There was no change noted except slight redness of the mucous membrane.

Dog B. Weight 20 pounds. Two c.c. of acriflavine were injected intravenously. Findings: There was no detectable change in the uterine horns.

Dog C. Weight 22 pounds. No treatment was given. Findings: The inoculated horn was one and one-half times larger than the opposite horn. The mucous membrane was congested and discolored.

These results indicate the possibilities of the dye as a prophylactic. They are of no practical value in so far as treatment is concerned because clinically one is not aware of infection until local or general symptoms appear. Therefore, it was decided to inoculate the uterine horn and institute treatment twenty-four hours later.

Results in Series II. In this series nine experiments were performed, in each of which three dogs were inoculated and twenty-four hours later two animals in each experiment were treated with acriflavine intravenously, the third dog being used as a control. The results were positive in Experiments 4, 6, 7, 8, 9, 10, and 11. In Experiment 5 the culture injected apparently was not virulent. The results in Experiment 12 were questionable, but there was definitely less change in the treated than in the untreated animal. Both uterine horns of the treated animals on culture yielded viable organisms. The temperature records in Experiments 8, 9, 10, 11 and 12 show that general symptoms are present twenty-four hours after inoculation.

Protocols of Series II:

Experiment 4. The uterine horns were inoculated with a culture of staphylococci. The uteri were removed one week after inoculation.

Dog A. Weight 30 pounds. Three c.c. of acriflavine intravenously. One and one-half c.c. of culture were injected into the horns in this animal. Findings: Both uterine horns were about three times normal size. There was no perisalpingitis present.

Dog B. Weight 26 pounds. No treatment was given. Uterus before injection was small virgin type. Findings: The inoculated horn was about five times normal size, the right horn was twice normal size. Both horns contained purulent material. There were extensive peritubal adhesions.

Dog C. Weight 20 pounds. Two c.c. of the dye were injected. The uterus before inoculation was the same size as in Dog B. Findings: There was no change in the size of the uterine horns and no peritubal adhesions.

Experiment 5. The uterine horns were inoculated with a culture of staphylococci. The uteri were removed one week later.

Dog A. Weight 22 pounds. Two and two-tenths c.c. of the dye were injected. Findings: There were no noticeable changes in the horns.

Dog B. Weight 25 pounds. No treatment was given. Findings: There was no detectable change.

Dog C. Weight 20 pounds. Two c.c. of the dye were injected. Findings: No detectable change.

Experiment 6. The uterine horns were inoculated with a culture of streptococci.

Dog A. Weight 35 pounds. Three and five-tenths c.c. of the dye were injected. The dog was pregnant at the time of operation, the horns being about 2 cm. in diameter. The dog would not respond to call the day of injection. It died two days after injected. The cause was undetermined. Findings: No detectable change due to infection. The death may have been due to toxemia from death of the fetus.

Dog B. Weight 28 pounds. No treatment was given. Dog died five days after inoculation, was very sick throughout time of the experiment. Findings: There were extensive dense peritubal adhesions. Inoculated horn was about three times preoperative size.

Dog C. Weight 20 pounds. Two c.c. of the dye were injected. Findings: The uterine horns were the same size as at operation. There were a few adhesions at the site of the ligature. Uteri of Dogs B and C were the same size before operation.

Experiment 7. The uterine horns were inoculated with a culture of staphylococci. The uteri were removed eleven days after operation.

Dog A. Weight 35 pounds. Three and five-tenths c.c. of the dye were injected. The horns were 5 mm. in diameter. The animal was acutely ill twenty-four hours after inoculation. Findings: Peritubal adhesions at the site of ligature. Mucosa normal, including placental sites.

Dog B. Weight 25 pounds. No treatment was given. At the time of operation the uterine horns were 5 mm. in diameter. Early pregnancy (?) The animal was acutely ill twenty-four hours later, but not as sick as Dog A. Findings: Mucosa was markedly congested and thickened; the placental sites were destroyed.

Dog C. Weight 14 pounds. One and four-tenths c.c. of the dye were injected. Animal was ill twenty-four hours later. Findings: There was no noticeable change in the horns.

Experiment 8. The uterine horns were inoculated with a culture of staphylococci and streptococci. The uteri were removed eleven days later.

Dog A. Weight 21 pounds. Two c.c. of the dye were injected. The horns were about 5 mm. in diameter. Early pregnancy (?) Findings: The inoculated horn was the same as at the time of inoculation. Moderate peritubal adhesions. There was considerable leakage of pus at the time of the inoculation.

Dog B. Weight 24 pounds. No treatment was given. The uterine horns were the same size and condition as Dog A at the time of inoculation. Findings: The inoculated horn was four times the size of the opposite horn. Extensive dense peritubal adhesions were present.

Dog C. Weight 20 pounds. Two c.c. of the dye were injected. The horns were about 2 mm. in diameter at the time of the operation. Findings: Both of the horns were the same size as at operation.

Experiment 9. The uterine horns were inoculated with culture of colon bacilli. The uteri were removed twelve days later.

Dog A. Weight 28 pounds. The horns were large, 2 cm. in diameter, two weeks postpartum. Three c.c. of the dye were injected. The temperature twenty-four hours after inoculation was 103°. Findings: Both uterine horns were about the same size, no evidence of a change from infection.

Dog B. Weight 21 pounds. The uterine horns were about 5 mm. in diameter. No treatment was given. The temperature twenty-four hours after inoculation was 103°. Findings: Inoculated horn from 20 to 40 mm. in diameter, opposite horn about 12 mm. in diameter.

Dog C. Weight 21 pounds. The uterine horns were about 6 mm. in diameter. Two c.c. of the dye were injected. The temperature twenty-four hours after the operation was 103°. Findings: Inoculated horns from 8 to 10 mm. in diameter.

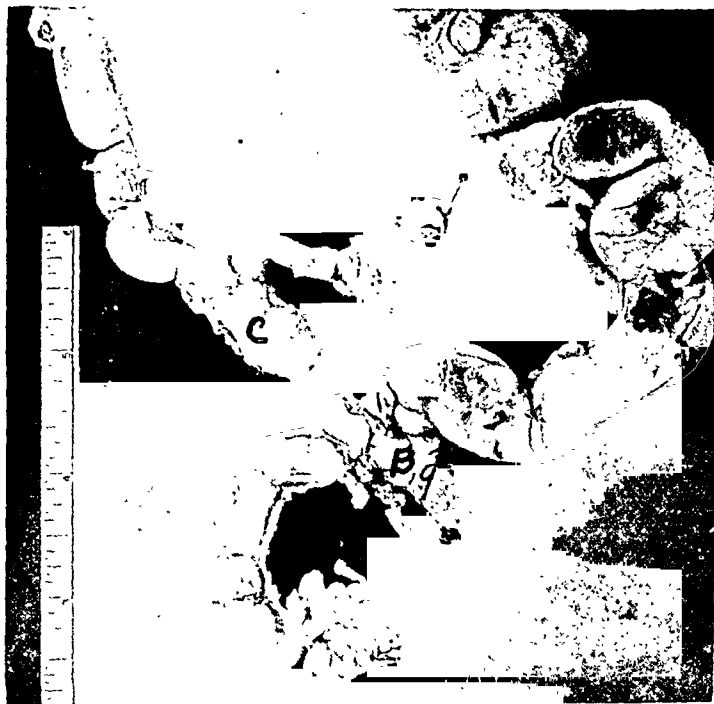


Fig. 1.—Specimens from Exp. 9. The uterine horns were inoculated with a culture of colon bacilli. Both uteri were the same size before inoculation. The upper specimen is from Dog C which was treated twenty-four hours after inoculation. The other specimen is from Dog B which was untreated.

Experiment 10. The uterine horns were inoculated with a culture of streptococci. The temperature was recorded twenty-four hours after inoculation. The uteri were removed seven days after inoculation.

Dog A. Weight 33 pounds. The right uterine horn was 2 cm. in diameter and contained a serous fluid. This horn was inoculated to learn if this pathologic condition of the horn would influence the control of the infection. Three c.c. of the dye were injected, and the temperature at the time was 103.4°. Findings: Both uterine horns were the same as before operation.

Dog B. Weight 26 pounds. The uterine horns were 5 mm. in diameter. No treatment was given. The temperature recorded was 103°. Findings: The dog died seven days after the operation apparently from infection. There was a large pyosalpinx with extensive dense peritubal adhesions. Inoculated horn was 20 to 30 mm. in diameter.

Dog C. Weight 22 pounds. The uterine horns were 3 cm. in diameter, ten days postpartum. Two c.c. of the dye were injected and the temperature at the time was 102.6°. Findings: The horns showed no change due to inoculation. No peritubal involvement.

Experiment 11. The uterine horns were inoculated with a culture of streptococci. The temperature was recorded twenty-four hours later. The uteri were removed ten days after operation.

Dog A. Weight 38 pounds. The uterine horns were 1 cm. in diameter. Three and eight-tenths of the dye were injected and the temperature at the time was 101°. Findings: Both of the uterine horns were about the same size as before the operation. There were slight peritubal adhesions.

Dog B. Weight 16 pounds. The uterine horns were 3 mm. in diameter, 1.6 c.c. of the dye were injected and the temperature at the time was 103°. Findings: Slight increase in the thickness of the inoculated horn.



Fig. 2.—Specimens from Exp. 11 are on the left and from Exp. 22 are on the right side. In both experiments cultures of streptococci were used.

Specimens B received treatment. The one on the left twenty-four hours and the one on the right forty-eight hours after inoculation. Specimens C are from Dogs C and received no treatment.

Dog C. Weight 20 pounds. The uterine horns were 5 mm. in diameter. No treatment was given. The temperature was recorded at 103.4°. Findings: The inoculated horn was 15 mm. in diameter and full of pus.

Experiment 12. The uterine horns were inoculated with a culture of staphylococci. The temperatures were recorded twenty-four hours later. The uteri were removed ten days after inoculation.

Dog A. Weight 25 pounds. The uterine horns were 7 mm. in diameter. There was some leakage at the time of the operation. Two and five-tenths c.c. of the dye were injected and the temperature at the time was 101.4°. The animal appeared to be very sick. Findings: Both horns showed a marked endosalpingitis, and contained a purulent fluid. There was slight increase in size.

Dog B. Weight 24 pounds. The uterine horns were 7 mm. in diameter. No treatment was given. The animal was not as sick as Dog A. Temperature recorded was 102°. Findings: Inoculated horn was greatly increased in size, the walls were bluish black, the horn was full of pus and blood.

Dog C. Weight 21 pounds. The uterine horns were 3.5 cm. in diameter. The animal delivered one week past, but there is a large mass in the left horn which may be placenta. The inoculation was made into the right horn. Two c.c. of the dye were injected and the temperature at the time was 103° F. Findings: This animal showed the least change of any in this experiment, but the inoculated horn was somewhat thickened and contained pus.

The temperatures were taken in this series of experiments only at the time of injection and show that at that time a general reaction from the inoculation had occurred. The results show that even when the treatment is instituted twenty-four hours after inoculation it has a definitely beneficial effect.



Fig. 3.—Specimens from Experiment 20. The uterine horns were inoculated with a culture of streptococci. Both uteri were the same size before inoculation. The upper specimen is from Dog A, which was treated forty-eight hours after inoculation. The lower specimen is from Dog C which was untreated.

Because of the results obtained in Series II, it was decided to make a series of experiments in which the dye was injected forty-eight hours after the inoculation.

Results in Series III. In this series nine experiments were performed, in each of which three dogs were inoculated and forty-eight hours later two animals were treated with acriflavine intravenously, the third untreated dog being used as a control. The results were positive in Experiments 13, 16, 19, 20, 21, and 22; questionable in Experiments 15, 17, and 18; and a failure in Experiment 14.

Protocols of Series III.

Experiment 13. The uterine horns were inoculated with a culture of staphylococci. The temperatures were recorded forty-eight and seventy-two hours after inoculation. The uteri were removed ten days later.

Dog A. Weight 21 pounds. The uterine horns were 7.5 mm. in diameter. Two and eight-tenths c.c. of the dye were injected and the temperature at the time was 103°. The next day the temperature was 104°. Findings: The inoculated horn was practically the same size as before operation. The opposite horn was 35 mm. in diameter and contained a yellowish mucus which was sterile.

Dog B. Weight 31 pounds. The uterine horns were 4 mm. in diameter, infantile in type. Three and one-tenth c.c. of the dye were injected, the temperature at the time was 102°. The next day the temperature was 104°. Findings: Inoculated horn was 8 mm. in diameter. It was sterile.

Dog C. Weight 30 pounds. The uterine horns were 7.5 mm. in diameter. No treatment was given. The temperature forty-eight hours after operation was 102°. The animal died seventy-two hours after inoculation. Findings: Metastatic abscesses throughout body. Inoculated horn 15 mm. in diameter, dark blue gangrenous, contained pus and blood. Culture from horn positive.

Experiment 14. The uterine horns were inoculated with a culture of staphylococci. The temperatures were recorded forty-eight and seventy-two hours after inoculation. The uteri were removed twelve days later.

Dog A. Weight 29 pounds. The uterine horns were 10 mm. in diameter. Two and nine-tenths c.c. of the dye were injected. Temperatures recorded were 102.2° F. and 102.6°. Findings: The inoculated horn was about 40 mm. in diameter. It contained viable organisms.

Dog B. Weight 26 pounds. The uterine horns were 4 mm. in diameter. Two and eight-tenths c.c. of the dye were injected. The temperatures recorded were 103.2° and 104°. Findings: Both horns 8 mm. in diameter. Contained viable organisms.

Dog C. Weight 25 pounds. The uterine horns were 10 mm. in diameter. No treatment was given. The temperatures recorded were 101.8° and 102°. Findings: There was no noticeable change due to infection; no fluid in the horns.

Experiment 15. The uterine horns were inoculated with a culture of staphylococci. The temperatures were recorded 48, 72, 96, and 120 hours after inoculation. The uteri were removed ten days after inoculation.

Dog A. Weight 20 pounds. The uterine horns were 7.5 mm. in diameter. The horn was traumatized with a forceps at the site of inoculation. The temperatures recorded were 103.4°, 102.6°, and 101.8°. No treatment was given. Findings: No noticeable enlargement of the left horn. The right horn was about 40 mm. in diameter and contained viable organisms. There were marked dense peritubal adhesions present.

Dog B. Weight 21 pounds. The uterine horns were 7.5 mm. in diameter. The horns were ruptured at the site of the inoculation and were traumatized with a forceps. Two and one-tenth c.c. of the dye were injected. The temperatures recorded were 103.4°, 103°, 101°, and 100°. The animal had a diarrhea throughout the period of observation and died of an intestinal hemorrhage one hundred forty-four hours after operation. Findings: Marked peritubal adhesions were present. Both horns were slightly larger than at operation.

Dog C. Weight 23 pounds. The uterine horns were about 7.5 mm. in diameter. The inoculated horn was not traumatized. Two and three-tenths c.c. of acriflavine were injected. The temperatures recorded were 103°, 102°, 104° (the dog had been running around before this temperature was taken), and 101.6°. Findings: There was practically no change in the uterine horns; culture was sterile.

Experiment 16. The uterine horns were inoculated with a mixed culture of short chain streptococci and of staphylococci. The temperatures were recorded 48, 72, and 120 hours after inoculation. The uteri were removed twelve days after operation.

Dog A. Weight 25 pounds. The uterine horns were 10 mm. in diameter. Two and five-tenths c.c. of the dye were injected. The temperatures recorded were 104.6°, 103.8°, and 102°. Findings: There were a few light adhesions, the horns were the same size as before operation.

Dog B. Weight 26 pounds. The uterine horns were 10 mm. in diameter. No treatment was given. The temperatures recorded were 104.4°, 103.2°, and 104.4°. Findings: There were very dense adhesions, impossible to separate the bowel and bladder from the uterine horns.

Dog C. Weight 20 pounds. The uterine horns were 10 mm. in diameter. Two c.c. of the dye were injected. The temperatures recorded were 104.8°, 102.2°, and 102°. Findings: There was slight increase in the thickness of the walls of the horns, and a few light adhesions.

Experiment 17. The uterine horns were inoculated with a culture of colon bacilli. The temperatures were recorded 48, 72, 120, 192, and 240 hours after inoculation. The uteri were removed twelve days after operation.

Dog A. Weight 32 pounds. The uterine horns were 7.5 mm. in diameter. Three and two-tenths c.c. of the dye were injected. The animal was able to be about throughout the course of the experiment. The temperatures recorded were 103°, 102°, 102°, 102°, and 101.2°. Findings: The inoculated horn was about 22 mm. in diameter.

Dog B. Weight 28 pounds. The uterine horns were 7 mm. in diameter. No treatment was given. The animal was very sick throughout the course of the experiment and was discharging a foul pus from the vagina after the fourth day. The temperatures recorded were 103.2°, 104°, 103.6°, 103.4°, and 103.6°. Findings: The walls of the horns were greatly thickened; there was no distention.

Dog C. Weight 25 pounds. The uterine horns contained feti about $3 \times 1 \times 1$ cm. The bacteria were introduced into the amniotic sac. Two and five-tenths c.c. of dye were injected. The animal was not acutely ill during the experiment. Temperatures recorded were 103.2°, 103°, 101°, 101°, and 102°. Findings: The inoculated pregnant horn was about twice the preoperative size.

Experiment 18. The uterine horns were inoculated with a culture of colon bacilli and gram-positive diplococci. The temperatures were recorded 48, 72, 96, and 144 hours after inoculation. The uteri were removed fourteen days after operation.

Dog A. Weight 22 pounds. The uterine horns were 10 mm. in diameter. Two and one-tenth c.c. of the dye were injected. The temperatures recorded were 104.8°, 104.4°, 104°. Findings: The uterine horns were twisted upon themselves, gangrenous, and filled with a bloody fluid. The horns were about 50 mm. in diameter, the distention was due to torsion.

Dog B. Weight 30 pounds. The uterine horns were 20 mm. in diameter. No treatment was given. The temperatures recorded were 103°, 103.6°, 103°, and 102°. Findings: The inoculated horn was about 40 mm. in diameter. It contained pus with viable organisms.

Dog C. Weight 50 pounds. The uterine horns were 20 mm. in diameter. Five c.c. of the dye were injected. The temperatures recorded were 103.8°, 102°, 101.6°, 101.2°. Findings: There was no noticeable change in the horns. They contained no fluid.

Experiment 19. The uterine horns were inoculated with a culture of streptococci. The temperatures were recorded 48, 96, and 144 hours after operation. The uteri were removed sixteen days after inoculation.

Dog A. Weight 15 pounds. The uterine horns were 5 mm. in diameter. One and five-tenths c.c. of the dye were injected. The temperatures recorded were 103°, 102°, and 101°. Findings: There was no change in the size of the horn; no peritubal adhesions.

Dog B. Weight 23 pounds. The uterine horns were 7.5 mm. in diameter. No treatment was given. The temperatures recorded were 101°, 102°, and 102.6°. There was a purulent bloody discharge from this animal throughout the course of the experiment. Findings: The uterine horns were about 20 mm. in diameter and imbedded in dense peritubal adhesions.

Dog C. Weight 28 pounds. The right uterine horn was 6 mm. in diameter. The left was distended with a clear fluid. The right uterine horn was inoculated. Two and eight-tenths c.c. of the dye were injected. The temperatures recorded were 103.6°, 102°, and 101°. Findings: There was no change in the size of the horns and no peritubal adhesions.

Experiment 20. The uterine horns were inoculated with a culture of streptococci. The uteri were removed twelve days after operation.

Dog A. Weight 20 pounds. The uterine horns were 9 mm. in diameter. Two and three-tenths c.c. of the dye were injected. The temperature at this time was 102.8°. Findings: The inoculated horn was 14 mm. in diameter. There were slight peritubal adhesions.

Dog B. Weight 12 pounds. The uterine horns were 20 mm. in diameter. The animal delivered five days before. One and two-tenths c.c. of the dye were injected. The dog died eight days after operation. Findings: The inoculated horn was about 20 mm. in diameter, not reddened from inflammation, no peritonitis, no peritubal involvement. The cause of death could not be determined.

Dog C. Weight 20 pounds. The uterine horns were 8 mm. in diameter. No treatment was given. The temperature two days after operation was 102.4°. Findings: Both uterine horns were about 35 mm. in diameter, and full of pus.

Experiment 21. The uterine horns were inoculated with a culture of streptococci. The temperatures were recorded 48, 96, and 144 hours after inoculation.

Dog A. Weight 26 pounds. The uterine horns were 3 mm. in diameter. Two and six-tenths c.c. of the dye were injected. The temperatures recorded were 105°, 103.6°, and 103.6°. The animal developed distemper seventy-two hours after operation. The wall of the inoculated horn was slightly thinner than the one on the opposite side and contained some clear fluid. The horn was about 8 mm. in diameter.

Dog B. Weight 21 pounds. The uterine horns were 5 mm. in diameter. Two and one-tenth c.c. of the dye were injected. The temperatures recorded were 103°, 102.4°, and 101.4°. Findings: There were no gross changes in the horns.

Dog C. Weight 24 pounds. The uterine horns were 5 mm. in diameter. No treatment was given. The temperatures recorded were 103°, 103.8°, and 104°. Findings: There was marked peritubal involvement, the horns were from 20 to 40 mm. in diameter.

Experiment 22. The uterine horns were inoculated with a culture of streptococci. The temperatures were recorded 48, 72, and 144 hours after operation.

Dog A. Weight 21 pounds. The uterine horns were 5 mm. in diameter. Two and one-tenth c.c. of the dye were injected. The temperatures recorded were 103°, 101°, and 102°. Findings: There were no peritubal adhesions; the horns were slightly thickened.

Dog B. Weight 22 pounds. The uterine horns were 3 mm. in diameter. Two and two-tenths c.c. of the dye were injected. The temperatures recorded were 103.8°, 103°, and 103°. The animal had distemper from the third day after the operation until the end of the experiment. Findings: The uterine horns were practically the same size as before the operation. There were no peritubal adhesions.

Dog C. Weight 25 pounds. The uterine horns were about 3 mm. in diameter. No treatment was given. The temperatures recorded were 103.2°, 102.8°, and 103.2°. Findings: The inoculated horn was 20 mm. in diameter. There were many firm peritubal adhesions.

In Experiment 15 the results were considered as questionable because in one of the treated animals there were marked peritubal adhesions, and an increase in the size of the horns, although there was no purulent material in them. This animal had some intestinal disturbance from the time of the operation until death from an intestinal hemorrhage. In the other treated animal there was practically no change except the thickening of the mucous membrane, whereas in the control the horns had increased in size and contained pus with viable organisms. In Experiment 17, the control animal had a profuse foul discharge and was much sicker than the treated animals. The wall of the uterine horn in this animal was much thicker than in the treated animals, and it is possible that it did not become distended because of the free drainage through the vagina. In Dog C in this, Experiment 17, the culture was injected into the amniotic sac. It is possible that the dye is not eliminated into the amniotic fluid in sufficient concentration to be effective. In Experiment 18 the horns of one of the treated animals became twisted upon itself and apparently the resulting congestion was the cause of the enlargement of the horns rather than the infection. The other treated animal in this experiment showed very little change. The cause for the failure in Experiment 14 could not be explained.

Cultures were made after the removal of the uteri in Experiments 13, 14, 15, 19, and 21. In all these, the untreated animals had viable organisms. The material from the horns of both the treated animals in Experiments 13, 19, and 21 and from Dog C in Experiment 15 produced no growth on glucose agar broth. A culture was not made from Dog B in Experiment 15 because the animal was found dead. In Experiment 18 there was no free fluid in the horns of the treated animal so no culture was made. In Experiment 14 neither control nor treated uterine horns were sterile. It was not determined whether or not the viable organisms recovered from the treated animals retained their virulence.

The temperature records show that the average temperature of the treated animals was definitely lower after treatment than that of the control animals at a corresponding time after inoculation. The average temperature of the treated animals at the time of treatment, i.e., forty-eight hours after inoculation, was 103.8°, whereas the average for the untreated animals at the same time was 103.1°. Seventy-two hours after inoculation the average temperature of the treated animals was 102.5°, while that of the untreated animals was 104.2°. In other words, the temperature of the treated animals dropped 1.3° while the

temperature of the untreated animals increased 1.1° . The effect of treatment on the average temperatures is equally noticeable at the end of one hundred and forty-four hours at which time the treated animals averaged 101.2° , while the untreated averaged 103.2° . The temperature in all the treated animals except Dog C in Experiment 16 dropped by lysis.

The results in this series show that the dye is effective in the majority of cases even when it is injected forty-eight hours after inoculation, but not as effective as when it is injected simultaneously with or twenty-four hours after inoculation.

The only objective effect of the dye on the dogs was an increase in the depth of the respiration at the time of the injection. In one case in which the dye was injected as rapidly as possible salivation resulted.

DISCUSSION

The conditions under which these experiments were conducted approximate those met with in practice, in that the organisms were introduced after some trauma to the uterine horns, which would more than equal the handling during operation, and the accidental implantation of organisms by the spreading of infection from the cervix, and in that treatment was introduced after general symptoms of infection appeared. It differs from actual conditions, in that the number of organisms introduced was probably greater than would occur under ordinary circumstances. In so far as judging results of treatment are concerned, these experiments have the advantage of being controlled. The animals in each experiment were in practically the same condition before operation, and were inoculated with the same organism. The changes in the time of instituting treatment in each series enabled us to ascertain how long after inoculation treatment would be effective. The results demonstrate the value of the dye as a prophylactic and in the treatment up to forty-eight hours after inoculation. The photographs show more clearly than the protocols the beneficial effect of the treatment. In the specimens illustrated the control and the treated uteri were practically the same size in all dimensions before inoculation. Definite differences occurred in almost every experiment. A striking effect of treatment which could not be shown in pictures was the absence or the scantiness of peritubal adhesions in the treated as compared with the control animals.

The question naturally arises, has any change taken place in the uterine horns at the end of forty-eight hours after inoculation? This can be answered in the affirmative. The increase in temperature indicates that a general reaction has taken place within twenty-four hours. The deep red color and the swelling of the mucous membrane of several uteri examined within twenty-four hours after inoculation show that a marked local reaction has taken place. At the end of forty-

eight hours there is a definite swelling of all the layers of the uterine horns.

Since we feel that the action of acriflavine in these cases is dependent upon the elimination of the dye from the blood stream by the genital mucosa, we would not anticipate any beneficial results if treatment were instituted after the entire mucous membrane was destroyed. To get the best results, therefore, the dye should be used early in the disease. The results of these experiments and the reported favorable clinical results of Bock,²² Bohland,²³ Cramer,²⁴ and of Heptner³¹ show the value of early treatment. However, if the dye works as Stephan²⁵ claims, we may expect some favorable results even after the destruction of the mucous membrane as a result of the stimulation of the defense mechanism of the reticulo-endothelial system by the dye.

Although a comparison of the temperatures of the treated and the untreated animals shows that the administration of the dye definitely lowers the temperature, a critical drop was noted only in one instance. The best results were obtained where the temperature fell by lysis. This is interesting because clinically the idea seems to prevail that an antiseptic dye in order to be effective must cause a critical drop in temperature. The value of acriflavine has been questioned by U. Franke³² and others because the administration of the dye did not cause a critical fall in temperature. The results in these experiments indicate that very beneficial effects may be obtained without a sudden fall in temperature.

SUMMARY

The results show that the intravenous injection of an appropriate dose of acriflavine has a definite beneficial effect on the course of the experimentally infected uterus of the dog. The earlier the dye is injected the more definite the effect. In some instances sterile cultures of the inoculated or infected uterine horn are obtained after acriflavine therapy. The beneficial effect of the acriflavine on the course of the uterine infection is also shown by a return to normal in body temperature by lysis. On the basis of these results it is believed that intravenous acriflavine in appropriate dosage is worthy of being tried in early uterine infections.

I desire to express my thanks to Dr. A. C. Iry for his cooperation and assistance in this work.

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SIGNIFICANT PROBLEMS FOR THE OBSTETRICIAN IN THE FIELD OF MAMMARY CANCER*

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CLINICAL experience in the Breast Service at the Memorial Hospital of New York has directed our attention to several problems which appear as important in obstetric as in surgical practice. Some are concerned with the etiology and diagnosis of mammary diseases, while others bear upon methods of treatment to be employed.

The apparent similarity in the physiology of the breast and endometrium has been brought out by H. C. Taylor, Jr. He believes that there is a close analogy between the cause of diffuse breast hyperplasia and glandular hyperplasia of the endometrium. It is known that fibroadenomas and chronic mastitis are found usually in the years of ovarian activity. Doctor C. Jeff Miller, of New Orleans, recently reported the association of gynecological lesions with painful benign conditions of the breast. Doctor Taylor has made a clinical study of nearly three hundred women with mammary lesions, special attention being directed to the histology of lactation deficiency, menstrual disturbance, and the existence of certain gynecologic pathologic conditions. The results indicated that the ovarian functions probably play some part in the production of benign mammary neoplasms. Several patients have appeared at the clinic with aggravated symptoms of chronic mastitis and considerable ovarian dysfunction. They have been completely relieved of their breast symptoms following irradiation of one or both ovaries. Cases selected for this purpose were usually those approaching the menopause. The treatment of additional cases will add to clinical experience in this group and may permit some interesting conclusions.

*Read (by invitation) at a meeting of the New York Obstetrical Society, May 13, 1930.

The relation of breast cancer to the ovary was recognized by Beatson in the beginning of the century, improvement being noted in cases of human breast cancer following bilateral oophorectomy. This relationship has also been recognized in mice. In a tumor-bearing strain of these animals the incidence of mammary cancer can be lowered if oophorectomy is done early. Moreover, breast cancer can be produced by ovarian implantation in male mice in which cancer never occurs. Doctor Taylor believes that a constitutional or endocrine basis for mammary cancer may be considered a reasonable hypothesis upon which to base additional clinical research.

Adair and Bagg, some years ago, were led to believe that interference with breast drainage may have an important bearing upon the development of cancer of the breast. Although Bagg has never committed himself to the principle that stagnation alone was the sole cause of cancer, he has found evidence of stagnation in the form of milk cysts associated with carcinoma in mice. He has noted these cysts before the advent of cancer, and then has seen true carcinoma appear adjacent

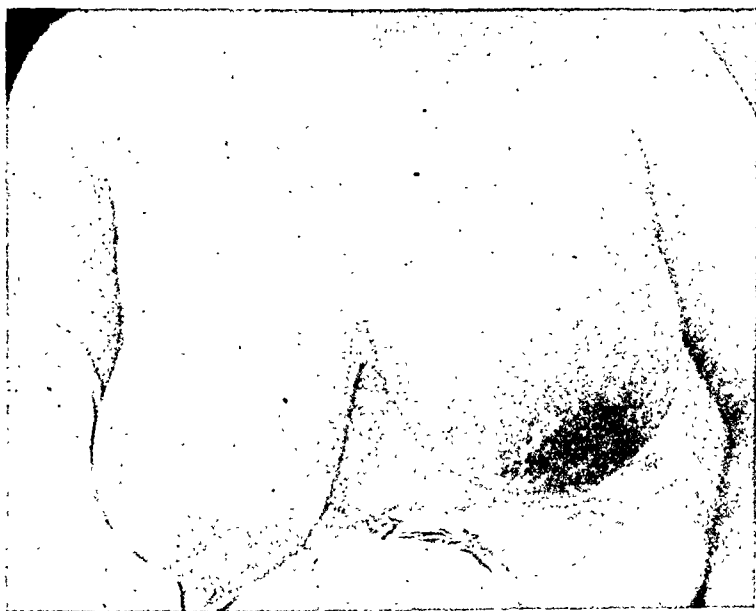


Fig. 1.—Primary inoperable carcinoma of the left breast, inflammatory in a young woman, aged thirty-five. Later extension to right breast. Death from pulmonary and bony metastases. Total duration one year and three months.

to and surrounding these small ducts. Loeb demonstrated that the prevention of mating in mice lowered the incidence of mammary cancer. Bagg has found that when mice are bred early and when the ovarian function is stimulated by repeated pregnancies, the incidence of cancer of the breast increases. Bragg did a large amount of experimental work. He tied off the ducts in the mammary glands of mice, and following this procedure carcinoma of the breast developed. Adair surveyed a large number of cases of mammary cancer and concluded that in many instances interruption of normal lactation was a factor in the later development of cancer. Carcinoma was found often in many segments of the breast where caking had previously occurred during lactation. He concluded that interruption of normal lactation and interference with drainage along the duct system might serve as carcinogenetic factors.

This work of Adair and Bagg raises a question of extreme importance to the obstetrician—Is early cessation of nursing concerned in

the production of breast carcinoma? This society might well conduct a study of patients delivered by its members, following up individuals over a long period of years to the age of fifty-five or sixty. Patients might be divided into two groups: those who had had no artificial interference with normal lactation and those in whom interruption had been produced. Such a survey covering a large series of patients would add valuable data upon this subject.

Pregnancy associated with cancer of the breast furnishes a clinical problem of interest to both obstetrician and surgeon. When pregnancy accompanies mammary cancer, the outlook for the patient is bad. A recent contribution in which I reported 306 patients with mammary cancer, forty years of age or under, revealed that in 11 instances pregnancy complicated the carcinoma of the breast. Three of

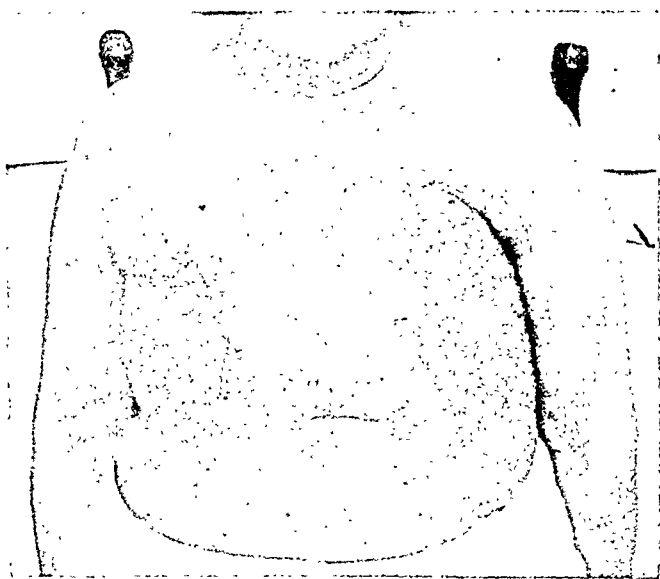


Fig. 2.—Recurrent inoperable carcinoma, inflammatory type, bilateral. Patient operated upon elsewhere. The case illustrates the futility of surgery in these cases. Death caused by pulmonary metastasis.

the patients fell into the primary inoperable group, the disease being far advanced when they presented themselves at the clinic. In one the disease ran an extremely rapid course, the woman dying two and a half months after the beginning of symptoms. Another patient who came to us with a recurrence which had appeared immediately after radical amputation, succumbed a few months later. Seven of the patients were in the primary operable group and received radical mastectomy with pre- and postoperative irradiation. One survived more than three years. This patient, thirty-six years of age, was two months pregnant when she consulted me concerning a small tumor in the breast and a palpable node in the axilla. Radical mastectomy and therapeutic abortion were performed at one sitting and postoperative irradiation with high voltage roentgen ray followed. She died five

years and ten months after operation. The next longest survivor was thirty years of age, three months pregnant at the time of her admission. Therapeutic abortion was immediately performed, and one month later a radical mastectomy was done. She died two years and nine months following the operation, postoperative irradiation with high voltage roentgen ray having been employed. Immediate therapeutic abortion should be done with such a clinical setting. When the condition of the patient permits, radical mastectomy should be performed at the same time; if not, as soon after as is feasible. Such patients should be advised against further impregnation if they are

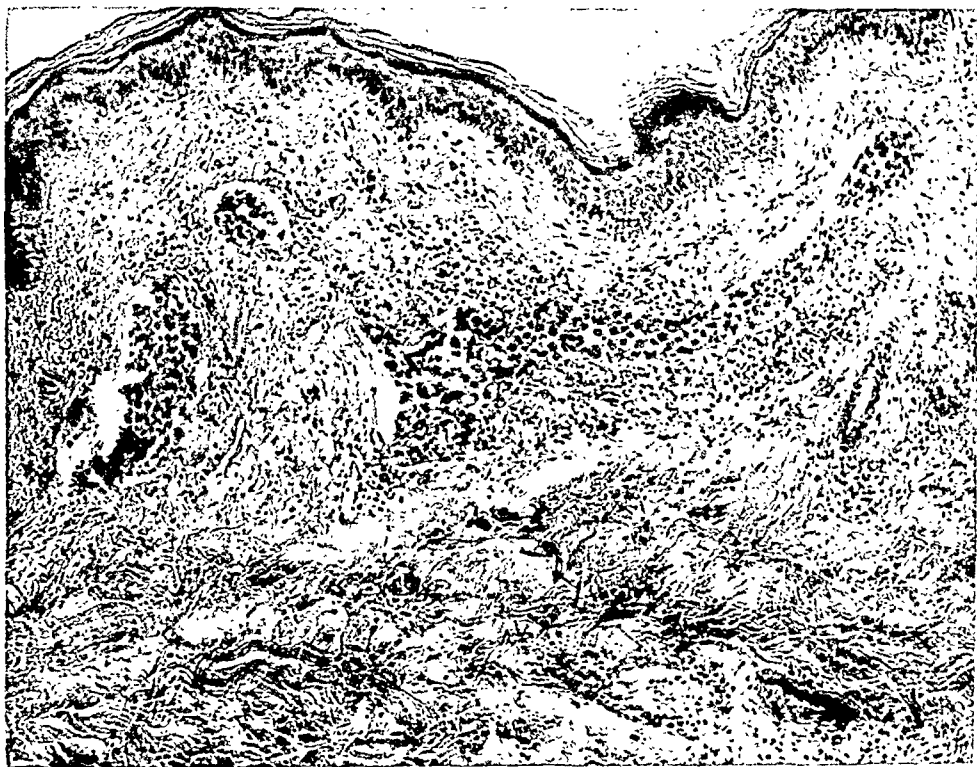


Fig. 3.—Inflammatory carcinoma of the breast showing lymphatics of the derma filled with tumor cells. Section shows lymphocytic infiltration. The edema is due to lymph stasis.

unwilling to submit to an immediate sterilization of the ovaries by high voltage roentgen ray.

Cooperation between the obstetrician and the surgeon is essential in the management of these patients. Disaster may result when it is lacking, as the following case illustrates.

A patient, thirty-two years old, six months pregnant, consulted me about a small tumor of the breast and a questionable node in the axilla. Although we strongly advised immediate therapeutic abortion, the obstetrician, desiring a viable child, demurred. Following the childbirth, the patient rejected radical mastectomy for ten months. During the interim the disease had advanced rapidly in spite of the employment of heavy external irradiation with radium and roentgen rays. She lived one year and ten months following radical amputation.

Postpartum lactation was coexistent with mammary cancer in 14 patients in the series of 306 cases previously quoted. The end-results in these 14 patients showed that this condition added as much hazard as when pregnancy existed.

Another subject of practical interest to the obstetrician is inflammatory carcinoma of the breast. This condition is often seen in young women and may appear during lactation. The diagnosis may be extremely difficult. Physical examination reveals a swollen breast which is red, hot, and tender, strongly suggesting the presence of a mammary abscess. Regional nodes are involved early in the course of the disease. Examination may fail to reveal a well-defined tumor in the breast. Temperature beneath the affected breast may register 1.5° F. above



Fig. 4.—Papillary adenocarcinoma of the breast of a female mouse that was not bred until four months of age. Ten consecutive litters, fifty-one young. Only the first litter was allowed to nurse. Age at tumor incidence thirteen months.

that on the normal side. The differentiation from abscess can usually be made for no one tender area may be discovered by palpation. If the diagnosis is doubtful, the best method of treatment is to apply adequate external irradiation over the breast, cross-firing in two directions, and the regional nodes should also be irradiated. A marked regression in the tumor and nodes usually occurs within from ten days to two weeks, if the lesion is an inflammatory carcinoma, for this type of cancer is often radiosensitive. Localization will appear in one portion of the gland if an abscess of the breast is present. Inflammatory carcinoma occurred 16 times in the series of 306 cases already quoted, an incidence of 5 per cent. I have made this error in diagnosis three times, the true character of the lesion being revealed in each instance following heavy external irradiation over the breast. Radical surgery

in the treatment of inflammatory carcinoma yields only disastrous results. These patients will survive longer with less discomfort if they are treated entirely by irradiation methods. One patient has survived the eight-year period with a clinical diagnosis of inflammatory carcinoma confirmed by four surgeons at the hospital. No biopsy was made in this case, therefore histologic verification is lacking. Another patient treated by external combined with interstitial irradiation has lived three and a half years and at present is without active evidence of disease.

The occurrence of carcinoma of the female genital organs associated with cancer of the breast presents an interesting clinical problem. Primary cancer of the female genital organs occurred 11 times in a

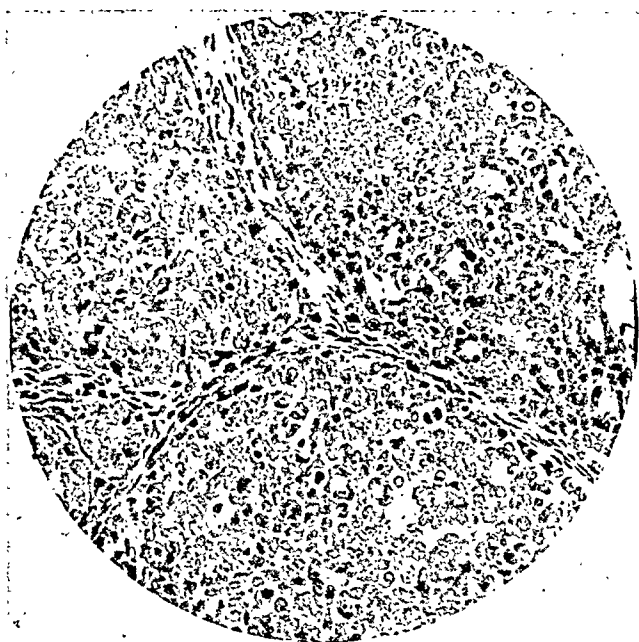


Fig. 5.—Solid cellular adenocarcinoma of the breast of a female mouse following ligation of the mammary ducts. Age at tumor incidence six and a half months.

series of 1827 patients with carcinoma of the breast, an incidence of 0.6 per cent. Therefore, one may expect to find a malignant neoplastic lesion of the female genital organs in every two hundred cases of mammary cancer. The following figures were obtained from the service of Doctor Healy at the Memorial Hospital, through whose courtesy we are permitted to quote them. Primary carcinoma of the breast occurred 11 times in a group of 1850 cases of cancer of the female genital organs, an incidence of 0.6 per cent. Similarly a complicating carcinoma of the mammary gland will be found in every two hundred cases of cancer of the female genital organs. Having found a cancer in either the breast or the female genital organs, one should bear in mind the possibility of a coexistent carcinoma elsewhere. One patient, fifty-five years of age, admitted to the breast clinic in a primary in-

operable phase of the disease, was sent to the hospital by a general practitioner. Although she also had a well-developed carcinoma of the cervix, but yet favorable for treatment, this lesion had been missed entirely by the physician referring her. A complete physical survey of the patient revealed the neoplasm of the cervix which received appropriate treatment by irradiation. Of the 11 patients showing neoplastic lesions of the female genital organs, 5 involved the cervix, 4 the corpus uteri, 1 the vulva, and 1 the ovary. Cancer in one portion of the body in no wise excludes the possibility of a primary cancer in another organ. The obstetrician or the gynecologist must therefore remember that although he has assigned himself a special field, he should not exclude from consideration lesions occurring elsewhere, especially those of the mammary glands.

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(For discussion, see page 855.)

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The fourth child of a woman who had previously given birth to three normal children without any complications, was born spontaneously after twenty-one hours of labor. Examination of the child showed a facial paralysis of the peripheral type on the right side and a large caput succedaneum on the left side of the occiput. During the last twenty years, only two similar cases have been observed at the Nancy Maternity.

J. P. GREENHILL.

De Vel.: Traumatic Necrosis of the Subcutaneous Fat of the Newborn Infant. Am. J. Dis. Child. 37: 1121, 1929.

The condition is often confused with sclerema neonatorum, scleroderma neonatorum, and other skin conditions which are not at all related to traumatic necrosis and have different clinical and pathologic pictures.

The traumatic etiology of the fat necrosis is substantiated by the following facts: large size of the infant; difficulty of labor; narrow pelvic measurements; application of forceps; presence of other evidence of obstetric trauma and localization of lesions on more exposed surfaces. These were present in nearly all reported cases.

A case is reported in detail, clinically and pathologically.

The lesions appear toward the end of the first and beginning of the second week, remain stationary for weeks or months and then regress, leaving no trace. Prognosis is good.

S. E. PESETKE.

THE METHOD OF DELIVERY AND END-RESULT OF TWO HUNDRED TWELVE CASES OF OCCIPUT POSTERIOR POSITION*

By NORRIS W. VAUX, M.D., PHILADELPHIA, PA.

IN PRESENTING a statistical paper, an apology should accompany the presentation, although it is impossible to formulate and show clearly the results obtained in certain obstetric procedures without resorting to this procedure.

Occiput posterior position is a complication of labor about which a great deal has been written. The literature regarding the posterior positions in pregnancy and labor is confused by masses of statistics and methods of delivery.

My reason for presenting this paper is to show the frequency of occiput posterior position complicating labor and its mechanism, and to set forth in as concise a manner as possible, the cases of this type which occurred in my obstetric service in the Philadelphia Lying-in Hospital over a period of thirty months from April 1, 1927, to September 30, 1929. There were 212 cases of occiput posterior position in 1,268 deliveries, which is half of the hospital service.

To clarify, if possible, my method of presentation, I shall group my material into seven parts, as follows: (A) the complications which occurred during previous pregnancies and the present gestation; (B) the difficulty in diagnosis of the presentation; (C) the course of labor and the morbidity associated with this condition; (D) the birth injuries resulting from delivery; (E) the obstetric operations necessary for delivery; (F) the maternal mortality, infant death and (G) the course of delivery, puerperal convalescence and subsequent pregnancies.

Puerperal mortality and morbidity occupy a very prominent place in obstetric literature. Puerperal mortality has not shown any marked improvement in the past twenty-five years. I agree with Adair "that the solving of the problem of maternal mortality does not lie with any one group or method of treating pregnancy, labor, and the puerperal state," but that the improvement in maternal statistics must lie with those who cooperate in the study and teaching of obstetric subjects in large maternity hospitals. That in this way the best ultimate solution can be attained and the best results secured for mother and infant. He further states "that new facts and methods should be continuously sought, and when established, generally known and applied." I cannot agree with some of my colleagues that maternal and fetal mor-

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tality can be improved upon only by allowing Nature to take its course, or that time and watchful waiting are the best obstetricians. My experience has taught me that after we have completed our antenatal study of each case, we should be able before the individual comes to labor, to determine in the majority of instances, the complications which we are about to face and what abnormalities will probably arise during labor, and to be ready to meet such conditions before serious and dangerous results for mother and infant are upon us. It is with this in mind that I present the result of 212 cases of posterior position and delivery. Incidentally this abnormality of position and the involved mechanism is one of the most misunderstood and badly handled complications in labor.

In collecting the material for this paper, the histories have been gone into most fully and the complications existing during previous labors and this pregnancy were closely investigated. The diagnosis of occiput posterior position was made 212 times or 16.7 per cent of the total 1,268 cases on my service. We attempted to make the diagnosis in the early part of the first stage of labor. Palpation, auscultation, x-ray and vaginal examination were relied upon chiefly to determine the existing presentation. This diagnosis was not left to the intern or house officer alone, but verified by one of the Junior Staff or myself. We admit quite frankly that our diagnosis was occasionally incorrect, the chief mistake being that of designating a case as an anterior position which later proved to be a posterior type, and the reverse was also true.

The complications which occurred during pregnancy, taken from the histories, and which were most pronounced during the antenatal state were:

Excessive nausea and vomiting in the early months occurred 16 times or 7.5 per cent of the whole number. Pernicious vomiting or hyperemesis gravidarum, occurred only once. Preeclamptic toxemia, 5 times or 2.3 per cent in the entire series. Tuberculosis of the incipient type developed during pregnancy in three cases. A total of 11.67 per cent of the 212 cases had their pregnancy seriously complicated before the onset of labor.

Premature labor occurred in this series 15 times, or 7.2 per cent of the 212 cases, which accounts in all probability for the large number of premature children, and necessarily increasing the percentage of stillbirths and babies dying after delivery. Of the 212 cases, pelvic measurements proved that 74 per cent had a definitely contracted pelvis, the external conjugate being less than 20 cm.; the true conjugate, 10 cm. or under.

The diagnosis before delivery of left occiput posterior position was made 118 times, which incidentally is a much higher percentage than appears in textbooks and statistics on the subject.

DeLee quotes from Carl Braun, that left occiput posterior position occurs 1 per cent of the times as against 9.3 per cent in this series; from Edgar, L.O.P. position occurs 3 per cent of the times as against 9.3 per cent; from Williams, 6,877 cases, L.O.P. position occurs 9.1 per cent of the times as against 9.3 per cent; Williams quotes Dubois, whose series comprised 1,913 cases, L.O.P. position occurs in 0.63 per cent of cases, and Pinard (500 cases), L.O.P. position occurs in 11 per cent as against 9.3 per cent in this series.

In my series, the right occiput posterior position occurred 94 times or 7.4 per cent, to which I call your attention as being of much less frequency than is the accepted rule.

Hirst gives right occiput posterior position as occurring 30 per cent of the times. Edgar, 17 per cent. DeLee, 29 per cent. Williams, 11.6 per cent in the same series quotes Dubois, R.O.P. position occurs 25.6 per cent of the times, and Pinard, R.O.P. position occurs 38.8 per cent of the times. Other authors declare that the right occiput posterior position occurs as frequently as 25 per cent.

In my series labor appeared at full term 188 times or 88.6 per cent of the 212 cases. Prolonged labor occurred less frequently in the posterior positions than in the anterior positions delivered on my service over the same period of time. This, in all probability, was brought about by what I consider to be timely interferences and a definite decision to terminate the labor at an elected point rather than allow the labor to be protracted and the patient and her infant approach the final act in a worn-out and exhausted condition.

The labor was ushered in by the rupture of the membranes in 3 instances or 1.4 per cent of the cases of posterior position as against 2.3 per cent of the 1,056 cases of anterior position. As is usually accepted in the posterior position cases, the first stage of labor was much prolonged. Twenty-two or 10 per cent of this number continued for over twenty-four hours before the first stage of labor was completed, while the short precipitated labor of under two hours occurred with unusual infrequency, twice or .94 per cent.

The posterior position occurred in almost half of these 212 women in their first full-term labor. It is interesting to note that as the parity of the individual increased, the percentage of posterior positions became much less frequent, which is contrary to the accepted rule that posterior positions occur less frequently in the primiparae, as the firm pelvic floor supposedly guides the most dependent portion of the vertex anteriorly.

This series shows a more decided variation in the complications and in the gravity and parturition than other authors have shown in their investigations. Spontaneous labor occurred 123 times or 58 per cent. Mid forceps were used 26 times or 12.2 per cent. Low forceps were used 25 times or 11.7 per cent. High forceps were not used in this entire series, but forceps were used 51 times or an incidence of 23.9 per cent of forceps deliveries. Manual rotation of the head was

accomplished in 4 instances. Forceps on the after-coming head was done 30 times or 14.1 per cent. We have followed the rule laid down by Dr. Piper and myself, of using after-coming-head forceps on all version cases and breech extractions occurring on our services. External version was accomplished twice, before the onset of labor and previous to the rupture of the membranes. Internal podalic version was done 30 times. Cesarean section, classical operation, using the low incision, was done in 7 instances or 3.2 per cent.

The low cervical and vaginal operations of cesarean section were not used in this entire series, as the disproportion was considered sufficient to proceed with elective section prior to the onset of labor, the low Beck operation being reserved for previously handled, or potentially infected cases sent in to the service from outside sources, none of which occurred in this series of posterior position.

Surgical induction of labor was resorted to 4 times or 1.8 per cent of the posterior positions. All of these 4 cases were border-line cesarean section pelvis and surgical intervention by bougie and rectal tube was instituted within two weeks of the probable date of term. The method of delivery of this series was criticized most carefully and with painstaking consultation and judgment.

In the spontaneously delivered cases or 58 per cent of the total 212 cases of posterior position, labor under two hours occurred twice. In this same number, labor over twenty-four hours occurred 22 times or 10.3 per cent of the total, giving the posterior positions an appreciably longer labor than the spontaneously delivered anterior positions in which labor over twenty-four hours occurred 76 times or 7.2 per cent of the total 1,056 cases.

Although the L.O.P. positions were more frequent, 118 times as against 94 times in R.O.P., the labor was proportionately long in both the right and the left positions.

Membranes ruptured before the onset of labor in 3 instances or 1.4 per cent which necessarily added a serious complication. Elective version was not attempted in any case where the membranes had ruptured before the onset of labor.

Every effort was made to conserve the amniotic sac and keep it from rupturing until the first stage of labor was completed or until timely interference was considered necessary.

Moderate postpartum hemorrhage of between 10 and 15 ounces occurred only 3 times or in 1.4 per cent. There were no severe postpartum hemorrhages of over 15 ounces and none which threatened life after delivery. There was no intrapartum hemorrhage listed in this series, and premature separation of the placenta did not occur in any of the 212 cases of posterior position. Uterine packing after delivery was not considered necessary in any of the deliveries.

In the delivery of this series, no interference was considered justified until the cervix was completely dilated and effaced. The vertex was considered to be well engaged at the brim and usually in mid pelvis before any interference or operation was resorted to. Forceps were used 51 times or 23.9 per cent against 123 spontaneous labors or 58 per cent. These forceps deliveries were performed on all cases where the first stage of labor had been completed for over two hours, where the occiput remained in a posterior position, where spontaneous anterior rotation did not occur, and where the spontaneous labor mechanism was arrested.

Axis-traction instruments were used in but few instances. DeWees, Tucker-McLane, and Dr. Piper's new axis-traction forceps proved highly satisfactory. The Scanzoni maneuver was used in all the posterior forceps cases after the head had been well drawn down to the pelvic floor. The Tucker-McLane forceps and Dr. Piper's axis-traction forceps were highly satisfactory in accomplishing this maneuver. Previous to this series, many other forceps were used with the idea in view of finding the most satisfactory instrument for delivery by forceps of these posterior cases. Among the instruments used were the Barton, the Kielland, the DeWees, the Simpson, and many others. All but the three previously stated proved to be less satisfactory in obtaining the results desired, and they were discarded chiefly on account of the occasional difficulty met with in their application and unsatisfactory results accomplished by us with them.

Against the forceps delivery of 51 times or 23.9 per cent, internal podalic version was done 30 times or in 14.1 per cent. In all but three instances, version was done with unruptured membranes, fully dilated and effaced cervix.

In these three other instances of version the membranes had ruptured shortly before version was attempted, but the entire amniotic fluid had not drained away and there was a sufficient amount of liquor remaining in the sac to make the version accomplished easily.

There were 105 male and 108 female infants, including one set of twins. Local congenital deformities occurred 4 times; 1 baby had spina bifida, 1 had clubfeet, 1 had a double harelip and cleft palate, and 1 had a moderate hydrocephalus.

Intracranial hemorrhage gave clinical symptoms in 2 cases, which were proved by obtaining bloody fluid by spinal and cisterna pontine puncture, with prompt relief of the symptoms.

There were 8 infant deaths after delivery, or 3.7 per cent, and 5 stillbirths, or 2.3 per cent. The causes of stillbirth were: One R.O.P. position was premature 6½ months, spontaneously delivered. One R.O.P. and 1 L.O.P. position had congenital syphilis, spontaneously delivered. One L.O.P. position with spina bifida. One stillbirth, alive

before delivery, was delivered by version. It was a moderate hydrocephalic child. The after-coming head delivered with difficulty as the child was large, overdue two weeks from her estimated date of confinement, and weighed 10 pounds 10½ ounces.

Causes of baby deaths after delivery, of which there were 8, were as follows: 2 R.O.P. positions spontaneously delivered, premature 6½ months. One died on the second day and one on the seventh day. One child weighed 3 pounds 15 ounces and one weighed 3 pounds 4 ounces. One R.O.P. position. The death was caused by bullous impetigo, on the third day. Delivered by low forceps. One R.O.P. and 1 L.O.P. position case had congenital syphilis. One was delivered by low forceps, and one by cesarean section. One R.O.P. position died on the fifth day. Delivered by low forceps. The autopsy showed the following: On the fifth day after delivery, a sudden rise in temperature and distention of the abdomen with rigidity and tenderness was noted. There was slight swelling of the face, slight patchy erythema of the eyes and left cheek, close to the location where the forcep blade had been applied. The blood culture which was obtained showed a *Bacillus proteus*. There was slight bulging of the fontanelles. Spinal puncture showed many cells and bacteriologic findings were similar to those obtained from the blood culture, a *Bacillus proteus*. Diagnosis was given of cerebral hemorrhage (birth trauma), omphalitis, generalized peritonitis (*Bacillus proteus*), septicemia (*Bacillus proteus*), brain abscess, acute purulent meningitis and cellulitis of face (*Bacillus proteus*), bronchial pneumonia, acute pericarditis (*Bacillus proteus*).

There was 1 maternal death, a primipara, unmarried woman, who was brought into the hospital in active labor, with a temperature of 101° F. and a pulse of 130. She had had no prenatal care although she had had her tonsils removed two weeks before admission. The throat culture on admission was mixed growth, but numerous colonies of hemolytic streptococci were present. The blood culture taken before delivery and the subsequent blood culture after delivery showed the presence of hemolytic streptococci. The patient ran a very high septic temperature and pulse, and died on the thirteenth day of hemolytic streptococcic septicemia. Her child survived.

The standard of morbidity was 100° F. twice in any twenty-four hours, not including the first twenty-four hours after delivery. The temperature was taken every four hours, night and day during the stay in the hospital. Of the 75 cases or 35.3 per cent which showed a morbidity: 1 had bronchitis; 3 had infected perineums; 28 had sapremia; 3 had pyelitis; 1 had septicemia; 1 had grippe; 2 had breast abscess; 34 had engorgement of the breast; 1 had postoperative reaction following cesarean section, and 1 had cystitis. A patient was considered to be

sapremic when the lochial flow was scanty and odorous in type and in which no other evidence of abnormality could be found to cause the febrile reaction.

The high percentage of morbidity under engorgement of the breasts occurred usually in the primiparae, during the physiologic engorgement of the breasts at the onset of lactation, from the second to the fourth day.

Maternal birth canal injuries are of interest. Perineal lacerations (1°) occurred 37 times or 17.4 per cent, in version 5 times, in forceps 4 times. The remaining 28 were in spontaneous deliveries. Perineal lacerations (2°) occurred 44 times or 20.7 per cent, which includes 15 episiotomies. In version, second degree lacerations occurred 9 times or 20.4 per cent, in forceps 18 times or 40.8 per cent, the remaining 17 or 38.6 per cent occurred in spontaneous deliveries. There were 9 cases of complete laceration, or 4.2 per cent; 1 or 11.1 per cent in version, and 4 or 44.4 per cent in forceps, the remaining 4 or 44.4 per cent occurred in spontaneous deliveries. Bilateral lacerations which caused sufficient hemorrhage to inspect the cervix, occurred 10 times or 4.7 per cent. There were 3 in versions or 30 per cent; in forceps there was 1 or 10 per cent.

In all operative procedures such as version and forceps deliveries, the routine cervical inspection was performed. Although the cervix was inspected in the version and operative deliveries, suturing of the cervix was not performed unless there was definite bleeding from the laceration, or unless the laceration was of sufficient magnitude to require suturing.

Cervical lacerations, bilateral, occurred 10 times or 4.7 per cent, version 3 times or 30 per cent, forceps once or 10 per cent. The remaining 6 or 60 per cent occurred in spontaneous deliveries. Cervical lacerations on the right side, 7 times or 3.3 per cent, all in spontaneous deliveries. Cervical lacerations on the left side, once or 0.47 per cent, version 1, forceps 0. Median episiotomy done 15 times, which is included in perineal lacerations (2°), or 7.07 per cent, version once or 6.6 per cent, forceps 12 times or 80 per cent. The remaining 2 or 13.3 per cent were in spontaneous deliveries.

The very significant part of this subject of maternal birth canal injuries shows that the lacerations of the perineum were much greater in the forceps than in the version cases. Lacerations of the perineum occurred in forceps cases 26 times or 28.8 per cent of the total number of lacerations, as against 15 times or 16.6 per cent in version.

The cervical lacerations were in the reverse proportion in version to those of forceps. In forceps once or 5.5 per cent, in version 4 times or 22.2 per cent.

The cervix was not inspected in all of the spontaneous labors. In each instance where perineal repair work was necessary, inspection of

the cervix was considered essential. Only those cervixes with definite lacerations and from which there was bleeding were repaired by suture.

In 51 forceps deliveries of the posterior positions, 21 or 41.1 per cent showed a morbidity following delivery; 12 or 46.1 per cent were mid forceps and 9 or 36 per cent were low forceps. Of the 185 forceps deliveries of the anterior positions, 55 or 29.7 per cent showed a morbidity following delivery; 13 or 26 per cent were mid forceps and 42 or 31.1 per cent were low forceps.

Of the internal podalic version cases in posterior positions, of which there were 30, 6 or 20 per cent developed fever, giving a clear illustration of the lower maternal morbidity following version delivery. Of the internal podalic version cases in anterior positions, of which there were 38, 16 or 42.1 per cent were febrile.

It is upon these statistics alone that I am led to believe that a timely internal podalic version, in posterior occiput positions, elective in type, is justified when the cervix is fully dilated and the membranes unruptured, in preference to watchful waiting or forceps delivery by Scanzoni maneuver under like conditions. The fetal death rate shows also that elective version under the specific indications given above, does not cause any material change in the death rate of newborns following delivery. In fact it shows distinctly an advantage over spontaneous and forceps deliveries.

In this series there was only one fatal intracranial hemorrhage following version, or 12.5 per cent, while in the forceps deliveries there were 4 or 50 per cent, or four times as many deaths after forceps delivery in infants than in the elective cases of version in the occiput posterior positions.

Our attention was forcibly and strikingly focused on the fact that a large proportion of the spontaneous anterior and posterior position cases showed a vertex entering the pelvis with the sagittal suture in the transverse position of the pelvic inlet, in contradistinction to what has been previously accepted and taught, that the sagittal suture enters the pelvic inlet in vertex cases in one or the other oblique diameters; that in the posterior occiput positions, a large proportion occurred in women with their first labor; that timely internal podalic version, when the indications of unruptured membranes and dilated cervix exists, proved a much more satisfactory and safer way of dealing with the occiput posterior positions than did the method of resorting to forceps and rotation of the vertex for delivery.

Notwithstanding the moderate increase in the lacerated cervixes in the version cases, the mortality following the delivery of the child

and the morbidity in the mother gave us a clear-cut indication for the use of elective podalic version in posterior positions.

The conclusions I would draw from this series of occiput posterior positions and delivery are:

1. That prenatal care of the mother with regard to the toxemias and antenatal health of the individual, has so overshadowed some of the equally important conditions existing in these women that the subject of pelvic abnormalities and positions prior to delivery have been greatly neglected.

2. The diagnosis of position should be made before labor onset if possible, and definitely established as early as possible after the onset of labor.

3. That the primiparous patient with a moderately contracted pelvis should be looked upon before the onset of labor as resulting in the possibility of a posterior position existing, with a difficult labor ahead.

4. The aim of conserving the amniotic sac intact, and guarding more carefully the patient's strength during the long first stage of labor in posterior position cases, is of paramount importance in whatever method of delivery is selected.

5. That interference is not justified in posterior positions, until the cervix is fully dilated and effaced and until the fetal head is at or near midpelvis.

6. That these views may be considered rather radical in nature, and the conservative obstetrician and general practitioner might criticize the methods of elective delivery in posterior position cases. But my answer to the accusation of radicalism in obstetric abnormalities shown above, is that those thoroughly conversant and competent to handle obstetric difficulties, are really, and in justice to the individual, practicing conservatism when the end-results show conclusively that the radicalism of which I might be accused, is in reality a conservative method of meeting complications in delivery of occiput posterior position.

2031 LOCUST STREET.

(For discussion, see page 837.)

THE ACTION OF THYMOPHYSIN ON THE HUMAN PREGNANT UTERUS IN SITU

BY M. PIERCE RUCKER, M.D., RICHMOND, VA.

IT IS extremely important that the obstetrician know the action of an oxytocic upon the human pregnant uterus in situ before he makes practical use of such a drug. Unfortunately such knowledge is not easily gained. Experiments in the laboratory with animals or with strips of human uterine muscle do not by any means hold good clinically. A noteworthy example of such discrepancy is afforded by epinephrin. In all animal experimental work except that upon rats and guinea pigs, the pregnant uterus has responded by motor effect to adrenalin.¹ According to Gunn² the excised human uterus contracts more markedly and more promptly to epinephrin than it does to pituitary substance. Yet the intact pregnant human uterus has been shown to relax after adrenalin has been given hypodermically.³

Nor can one trust entirely one's own senses as to whether the uterus contracts and relaxes in a normal manner. When pituitary extract began to be used clinically it caused normal rhythmic contractions of the uterus. One could feel the contractions with the hand upon the abdominal wall. Yet what was really happening was an incomplete tetanus, i.e., contractions without complete relaxation in between. This I⁴ was able to show graphically by connecting the stem of a Voorhees' bag that was within the uterus to a mercury manometer. A float carrying a writing point indicated any change in the level of the mercury in the distal arm of the manometer, and consequently any change in intrauterine pressure.

In a similar manner I have studied the behavior of the uterus after the intramuscular injection of thymophysin in four cases.

CASE 1.—Mrs. N., aged twenty-five, para ii, L.O.P. Labor induced at term with a number 5 Voorhees' bag. The patient was given $\frac{1}{6}$ gr. of morphine and $\frac{1}{200}$ gr. of hyoscin before the bag was inserted, and $\frac{1}{200}$ gr. of hyoscin one hour afterward. The kymograph showed small regular uterine contractions lasting three-fourth minute with a pause of three or four minutes, beginning one hour after the bag was placed. A third hypodermic of $\frac{1}{200}$ gr. of hyoscin was given two and one-half hours after the bag was inserted and an hour later $\frac{1}{2}$ c.c. of thymophysin was given intramuscularly. There was no change in the frequency or the duration of the uterine contractions, but perhaps a slight increase in the force. Patient was one and one-half hours later given 1 c.c. of thymophysin but by this time the bag was out of the cervix and no record of the behavior of the uterus could be obtained. The patient was delivered by version under ether anesthesia. The baby, a boy, measured 49½ cm. and weighed 3243 gm. The puerperium was uneventful.

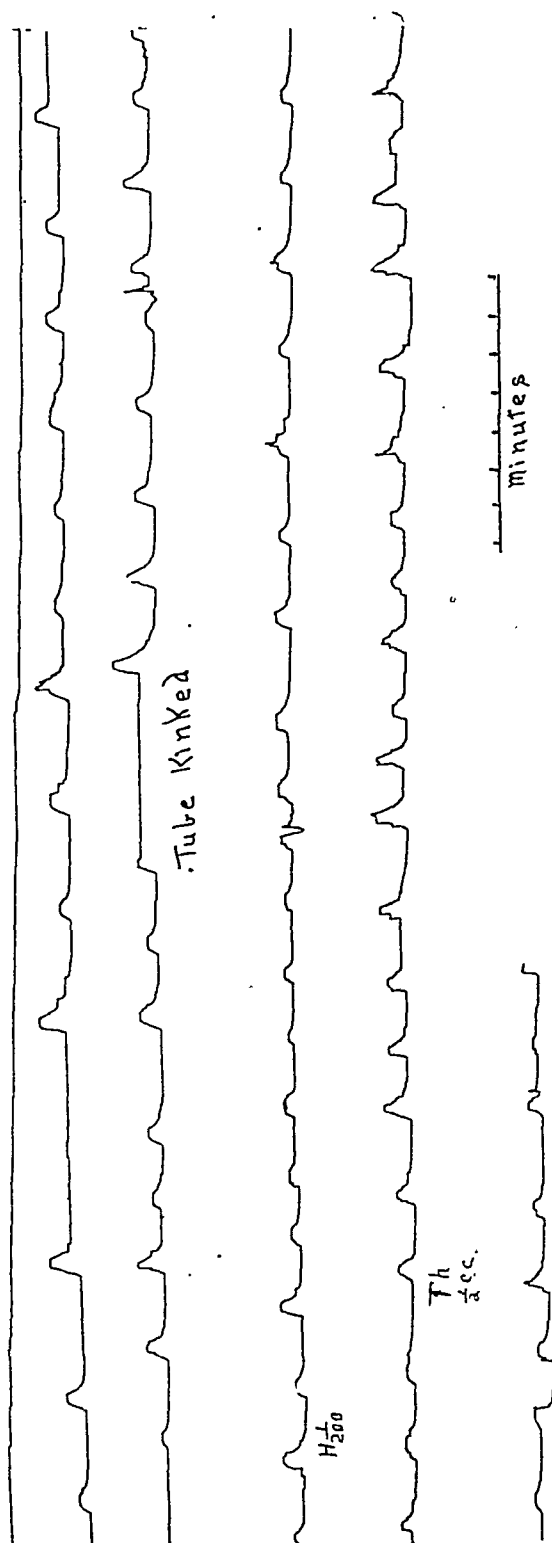


Fig. 1.—Hystero-gram of patient at term. The drum revolves once in fifty-nine minutes. It is raised at the end of that time, so that each line is approximately one hour later than the line above.

CASE 2.—Mrs. M., aged thirty-nine. Patient had had 3 children and no abortions. Labor was induced at the fifth month on account of a rising blood pressure and albuminuria. At 10:50 P.M., April 16, a rubber catheter was introduced through the cervix and the vagina was packed with gauze. The patient began having pains at 11 A.M., April 17. The catheter and packing were removed and a number 3 Voorhees' bag was introduced. Patient was given 1 c.c. of thymophysin. Within three minutes a change was noted in the hystero-gram. The uterus did not relax between contractions, and the contractions became more frequent but less forceful. Sixteen and one-half minutes elapsed before the former base line was reached between "pains." After twenty minutes the contractions were comparable to those before the thymophysin was given. Patient expelled the bag and two large clots at 9:30 A.M., April 18. After that she had no more pains. At 3 P.M. the uterus was cleaned out with the finger. The puerperium was uneventful.

CASE 3.—Mrs. B., aged twenty-two, primigravida, had been having chills and pyuria for two weeks in spite of energetic medical treatment by her family physician. Labor was induced with a number 5 Voorhees' bag thirteen days before the expected day for her confinement. When the contractions were well established and the cervix one-half dilated, 1 c.c. of thymophysin was given intramuscularly. Within three minutes there was a marked increase in uterine tone and an increased frequency of the contractions. The individual contractions that were superimposed upon the curve of tonic contraction were much less than the contractions before or afterward. The summits of these waves were a little lower than the peaks of the contractions before or afterward and their bases were more than one-fourth as high as the summits of the subsequent contractions. Stated in figures, the contractions before the thymophysin was averaged 45.2 mm. of Hg. The eleven contractions after the thymophysin averaged 32.8 mm. of Hg the highest being 62 and the lowest 10 mm. of Hg. The average height of the first 5 contractions after the curve had again reached the normal base line was 62.4 mm. of Hg. At the summit of the tonic curve the line between the waves of contractions was 16 mm. of Hg above the normal base line. This tonic state lasted twenty-four minutes.

One hour and three quarters after the thymophysin was given the cervix was fully dilated, and the patient was delivered by version under ether anesthesia. The baby, a male, weighed 3494 gm. and measured 52 cm. total length. The mother's temperature was normal by the third day and both mother and baby left the hospital on the eighth day.

CASE 4.—Mrs. C., aged thirty-five, para viii, entered the hospital in labor at 2 A.M. Her pains, however, stopped soon after her admission to the hospital. At 1:05 P.M., the cervix was thin and admitted 3 fingers. A number 5 Voorhees' bag was inserted. Forty minutes later 1 c.c. of thymophysin was given intramuscularly. There was a response within three minutes (as shown in Fig. 3). When the bag was out of the cervix, it was deflated and removed and a version and extraction was done under ether anesthesia. The baby, a female, weighed 3473 gm. and measured 51 cm. Puerperium was uneventful.

COMMENT

Four cases were studied as to the effect of the intramuscular injection of thymophysin upon the pregnant human uterus in situ. In one case at term there was apparently no change in type of uterine contractions or in the tone of the uterus after $\frac{1}{2}$ c.c. of the drug. One case in the fifth month of pregnancy showed an increased frequency, a decreased force of contractions and an increase in the tone of the

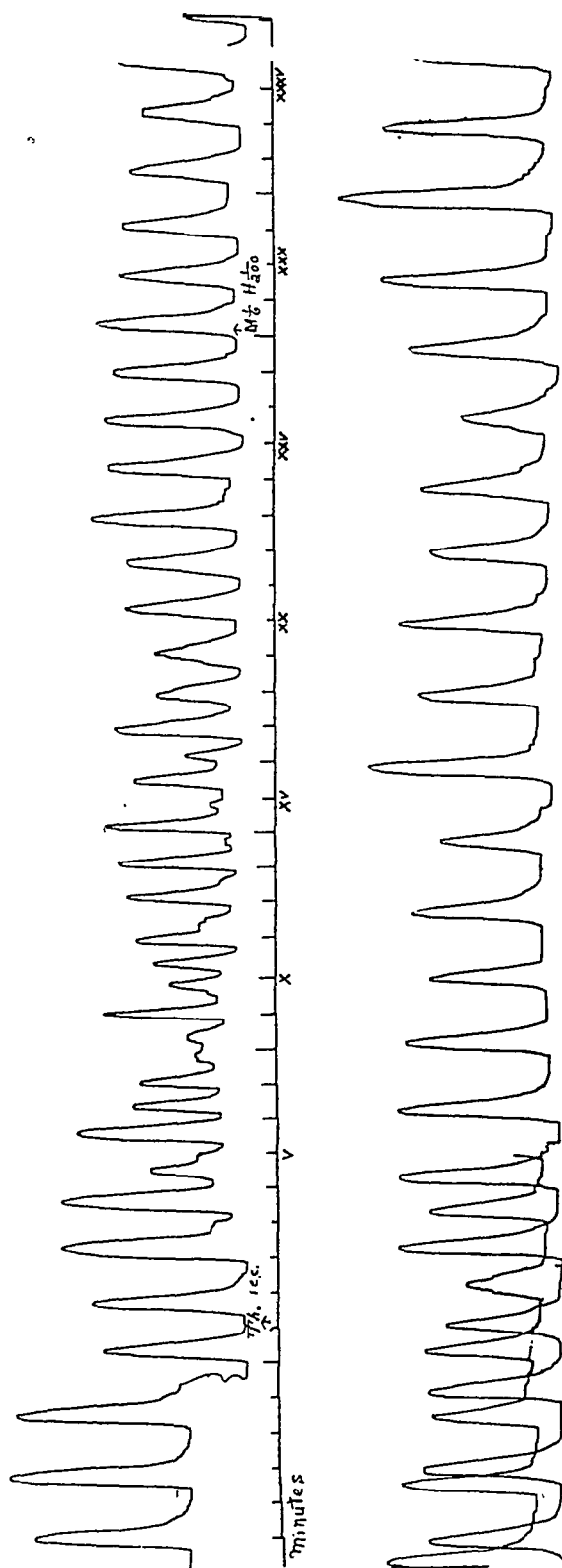


Fig. 2.—Hystero-gram of patient in whom labor was induced at fifth month.

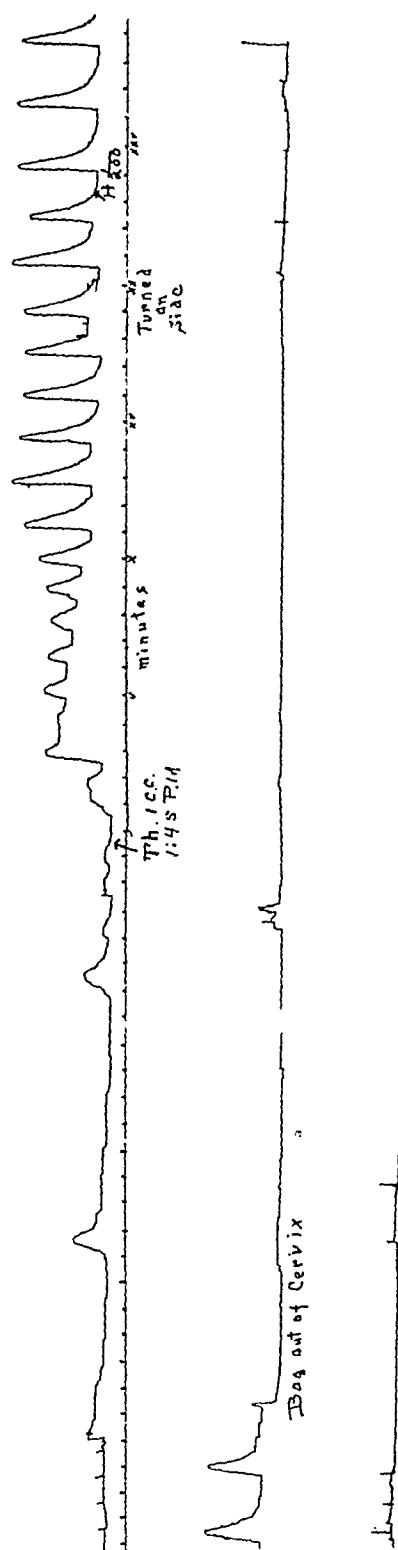


Fig. 3.—Hystero-gram. Patient at term.

uterus between contractions after a dose of 1 c.c. In two cases at term, similar but more marked changes occurred after 1 c.c. doses. It should be emphasized that where any response was elicited at all, it was that of an incomplete tetanus lasting from sixteen to twenty-four minutes. As in the case with posterior pituitary extract, the response is prompt, occurring within two or three minutes. In the premature case the response was even more prompt than in the case with pituitary substance.

Whether this is the only type of response of the human pregnant uterus must remain for some one more venturesome than I to decide. The character of contractions that I found, is a dangerous one both for mother and child. When the uterus does not relax between contractions there must be serious interference with the circulation both in the uterine wall and in the placenta and consequently danger of rupture of the uterus and of asphyxiation of the fetus.

Of course the great majority of cases escape such disasters. I need only to remind you that the oxytocic properties of ergot were first published in 1808⁵ and as late as 1882, textbooks on obstetrics recommended it to shorten and facilitate labor. Now everyone agrees that it is a dangerous drug to use before labor is completed. Pituitrin was introduced into obstetric practice in 1909 and the first case of rupture of uterus following its use was not reported until 1913.⁶ Temesvary introduced thymophysin in 1925 and a case of rupture of the uterus following its use has already been reported.⁷

To the student of the history of oxytocics there is a strange familiarity to the descriptions of each new drug. In 1835 it was said of ergot⁸: "In small quantities, it is a safe and valuable remedy, and has a specific effect on the uterus, exciting gradual but powerful contractions of that organ when the natural parturient action is diminished or has entirely ceased. It does not produce permanent contraction, but merely renews the labor pains and augments their force . . . (it) abridges human suffering which might continue hours and days unalleviated; it supersedes the use of instruments in many cases; and it saves the attendant much anxiety and useless loss of time." This was written about one hundred years ago. The same thing was written of pituitrin, many authors calling it the "medicinal forceps." And the same thing is being written of thymophysin. Temesvary⁹ calls it "medicamental dilator." He recommends 1 c.c. as the initial dose, to be repeated if the effect wears off before labor is completed. In exceptional cases a third dose may be necessary. In the literature (*sic*) sent out by the firm marketing the preparation in this country, it is stated that it never causes tetanic contractions. Such statements can be easily disproved with a little laboratory equipment at the bedside, but I feel sure that it will take time and a number of disasters to convince the medical public.

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MEDICAL ARTS BUILDING.

AN ANALYSIS OF 50 CASES OF TOXEMIA OF PREGNANCY*

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J. WHITRIDGE WILLIAMS¹ states that 50 per cent of the pregnant women show evidence of toxemia, which he classifies as pathologic. Of the 25,000 women who died annually during the last decade in the United States from childbirth, 5,000, or 20 per cent died as a result of the toxemias of pregnancy and of these, 3,000 from eclampsia. Still more appalling was the fetal mortality averaging about 30 per cent in eclampsia alone! Of late there has been a considerable decrease in the mortality rate of pregnancy, on account of prenatal treatment, but the figures of the mortality and morbidity for both mother and child are still such as to warrant further investigation of this baffling problem.

The purpose of this paper is to analyze 50 consecutive cases of toxemias of pregnancy which occurred in a series of 2,023 admissions at the North Hudson Hospital, from October, 1923, to March, 1930, in order to gather information which might shed some light upon the diagnosis and the management of such cases.

Toxemias of pregnancy generally are understood to be those disorders coincident with gestation and probably caused by the accumulation, within the maternal blood, of toxins or poisonous substances, derived from the fetus or placenta and which are neither neutralized by the organs of metabolism (liver, reticuloendothelial system, thyroid, pancreas, etc.) nor eliminated by the emunctories (kidneys, intestines, skin, lungs, etc.).

According to Polak,² the toxemias of pregnancy are not caused by any special toxin or toxins, either fetal or placental, but rather by the over-

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load suddenly placed on the maternal organism; consequently metabolic strains are set up in the mother to meet the demands of the fetus, and result in a disturbance of the metabolic balance, which in turn affects the hepatic and the renal function. Likewise Titus and his co-workers^{3, 4} believe that toxemias are caused by carbohydrate deficiency, due to the unexpected demand of glycogen on the part of the fetus. On the other hand, Williams⁵ points out that the "ultimate cause of the late toxemias of pregnancy is due to the formation of some chemical substance (toxin) which leads to a profound disturbance of metabolism, accompanied by certain organic lesions."

Although the underlying cause of such disorders may in the last analysis be one, which may have involved all the body-systems and organs, to such an extent as to justify some authors in calling the toxemia "histopathia gravidarum" (Barlocco,⁶ Zondek and Franz⁷), yet for purposes of clinical study, we speak of toxemias or toxicoses, "Gestosen" of Freund.

There is still great divergence among obstetricians in regard to a proper classification of the toxemias, and this is explained on the grounds that it is not always possible to arrive at the correct diagnosis at the bedside. As a matter of fact, it is sometimes necessary to observe the further course of the puerperium, and there are some cases in which only a postmortem would enable us to discover the fundamental nature of these disorders. Though in a few cases we have met with syndromes formed by the combination of two or more clinical entities, however, we have adopted the following classification, proposed by Stander,⁸ because in the large majority of cases, it has been fully justified by the symptoms as well as the laboratory findings:

- I. Eclampsia.
- II. Preeclampsia.
- III. Low Reserve Kidney.
- IV. Chronic Nephritis Complicating Pregnancy.
- V. Hyperemesis Gravidarum.

As no cases of acute yellow atrophy of the liver, or impetigo herpetiformis (Hebra) have occurred among the 50 cases, they need simply to be mentioned here.

GROUP I: ECLAMPSIA

This consisted of 21 cases, or 42 per cent of the sum total of the series. The average age incidence was twenty-seven years; there were 13 primiparae, or 62 per cent, and 8 multiparae, or 38 per cent (see Fig. 1); the average number of pregnancies was 2.4, and the period of gestation eight months. In the previous histories, influenza, fibroids, and manic-depressive psychoses were noted in 2 cases each; in 3 cases there was a concomitant pyelitis. The following symptoms and signs were present in the order named: hypertension, albuminuria, convulsions, and coma each 100 per cent; headaches of sudden onset, 52.3 per cent; edema, 33.3

per cent; blurred vision, 19 per cent; dizziness, nausea and vomiting, 14.2 per cent; constipation, 9.5 per cent; epigastralgia, polyuria, nocturia, cyanosis, dead fetus, each 4.7 per cent. The average blood pressure was 183/116. The convulsions were of four types: intrapartum in 9 cases, antepartum in 7, postpartum in 3, and mixed in 2. Albuminuria was found in all cases, with an average of 25 per cent; casts, either hyaline or granular, were present in $\frac{2}{3}$ of the cases. The blood chemistry, which was taken in over 50 per cent of the cases, disclosed the following: blood sugar, average 100 mg.; nonprotein nitrogen, 29.9; creatinine, 1.67; uric acid, 2.8; the carbon dioxide combining power was somewhat higher than normal, and the urine was normal in 6 cases; in 13 cases, albuminuria was still present with an average of 1 per cent.

As to the treatment, 10 cases were spontaneous deliveries, 4 were induced, and 7 required obstetrical intervention; of the latter 4 were delivered by low forceps, 1 by midforceps, and 2 by vaginal hysterotomy (Dührssen). Of the 21 patients, 18 or 85.7 per cent were cured, 2 or 9.5 per cent improved, and 1 or 4.8 per cent died; the cause of this single death was pulmonary edema complicating fulminating eclampsia. In regard to the infants, 16 or 72.8 per cent were born alive, while 6 out of 22, or 27.2 per cent died (this includes a pair of twins, one of whom ex-

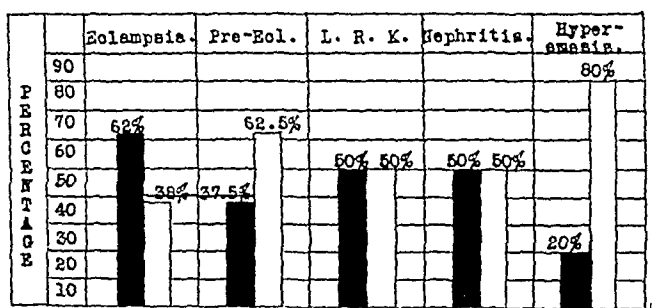


Fig. 1.—Incidence of primi- and multiparity.

pired shortly after delivery); this rather high mortality may be explained on the basis of prematurity associated with toxemia, and of asphyxia resulting from accumulation of carbon dioxide in the blood of the mother, and in some instances by obstruction of the fetal circulation by placental infarcts. Although the percentage of the operative cases may appear somewhat high, it is to be noted that in the vast majority of cases a special hygienic, dietetic, and symptomatic treatment was given to each individual patient on admission, and only when such treatment failed to effect improvement, was obstetrical interference resorted to. The average postpartum stay in the hospital was 13.5 days.

The principal measures used in general have been the following: a low protein, salt-free diet; morphine hypodermically and chloral hydrate and bromides per rectum; chloroform, as advocated by Stroganoff,⁹ has never been used; the patient placed in a darkened room, away from noises and visitors; high hot alkaline colonic irrigations once a day, and magnesium sulphate, as advocated by Lazard and his associates^{10, 11} used intravenously; in rarer instances magnesium sulphate was administered by means of a Faucher tube after gastric lavage. In one case phlebotomy, after the method of Lichenstein¹² and Beck,¹³ was used, with recovery of the patient. In order to aid elimination, water has been administered freely by mouth, unless the patient was in coma, when from 300 to 500 c.c. of a 10 per cent glucose solution was given intravenously.

GROUP II: PREECLAMPSIA

In this group were 8 or 16 per cent of the series; the average age incidence was thirty-one and one-half years; there were 3 primiparae, and 5 multiparae; the average number of pregnancies were 5; all the cases occurred in the third trimester, the average being eight and one-half months. In the previous history diphtheria, nephritis, influenza and adherent placenta were noted. The following symptoms were met with: hypertension and albuminuria, 100 per cent; edema and blurred vision, 75 per cent; headaches, $62\frac{1}{2}$ per cent; dizziness, 50 per cent; albuminuric retinitis, $37\frac{1}{2}$ per cent; constipation, 25 per cent. The average blood pressure was 183/116. Albumin was found to average 16.3 per cent; 5 cases out of 8 showed casts. Blood chemistry: average blood sugar, 88.1 mg.; creatinine, 1.78; uric acid, 2.5; nonprotein nitrogen, 32.5; carbon dioxide, 27 per cent. On discharge blood pressure was slightly above normal, and urine was normal in 5 or $62\frac{1}{2}$ per cent of the cases, with only traces of albumin in the remaining 3, or $37\frac{1}{2}$ per cent of the cases. Treatment: 50 per cent of the cases had spontaneous delivery and 50 per cent had obstetrical interference: in one case version and extraction, in a second induction of labor with Voorhees' bags, followed by forceps extraction, the third induction by Krause's method and extraction by forceps, and the fourth, induction with intranasal application of pituitrin (Hofbauer¹⁴) followed by thymophysin according to the method of Temesvary.¹⁵ This method seems to be ideal especially in multiparae, in the absence of conditions obstructing labor. Outcome: $87\frac{1}{2}$ per cent of the cases cured; $12\frac{1}{2}$ per cent improved; $87\frac{1}{2}$ per cent live infants; $12\frac{1}{2}$ per cent stillbirths; average postpartum stay in hospital, twelve days. The medical treatment has been along the same lines as that for eclampsia.

GROUP III: LOW RESERVE KIDNEY

Eight cases or 16 per cent formed this group. Average age incidence, thirty-two and one-half years, with 4 primiparae and 4 multiparae, and an average number of pregnancies of 2.8. The period of gestation averaged eight and six-tenths months. The previous history records one patient suffering from pneumonia and puerperal infection and having had 4 stillbirths; one with rheumatic fever; one with malaria and a stillbirth, and another with 2 stillbirths and 2 miscarriages. The symptoms encountered were: hypertension and albuminuria in 8; headaches in 5; nocturia, edema, and polyuria in 3; nausea and vomiting and constipation, each in 2; blurred vision, restlessness, dyspnea, in one each. Average blood pressure, 176/104. Albumin found in all cases, with an average of 5.7% by volume; hyaline casts in 3 cases. Blood chemistry: average figures were: sugar, 80 mg.; nonprotein nitrogen, 31; creatinine, 1.7. On discharge blood pressure was normal in all cases, and the urine normal in 7 cases, only 1 showing a trace of albumin. Treatment: 1 case had a spontaneous delivery; 1 induction of labor with Voorhees' bags, 4 were delivered with forceps, and 2 by abdominal cesarean, one under general, and the other under local anesthesia. Outcome: 100 per cent of the cases were discharged cured, with a postpartum stay in the hospital of twelve and four-tenths days. Live children 7, or $87\frac{1}{2}$ per cent; stillborn, 1 or $12\frac{1}{2}$ per cent. As to the treatment, the patients were placed on a low protein, salt-free diet, complete rest in bed, etc., but as the majority of the cases did not show any clinical improvement in spite of the treatment, labor was induced or delivery hastened by obstetrical interference, in order to prevent any permanent renal damage.

GROUP IV: CHRONIC NEPHRITIS COMPLICATING PREGNANCY

In this group are included 8 cases, or 16 per cent of the series; age incidence average twenty-eight years; there were an equal number of multiparae and primiparae, with an average number of pregnancies of 4.2; the average period of gesta-

tion was seven and one-half months. In the previous history were noted: diphtheria in 3 cases, pneumonia in 2 cases, chronic nephritis, and acute rheumatic fever in 1 case each. The following symptoms were present: albuminuria and casts, and hypertension, 100 per cent; uremic convulsions, headaches, blurred vision, albuminuric retinitis, and constipation, each 2 cases, or 25 per cent; epigastralgia, dizziness, pains in the loins, hematuria, nausea and vomiting, and fever, in 1 case or 12½ per cent. Average blood pressure, 183/102. Albumin averaged 24.4 per cent by volume; casts of all descriptions were found. Blood chemistry: average figures were—sugar, 97 mg.; nonprotein nitrogen, 44.5; creatinine, 2.1; uric acid, 2.7; carbon dioxide, 38 per cent. On discharge the blood pressure still remained somewhat high, average 160/80, and the urine showed from a trace to 5 per cent albumin, and occasional casts.

Treatment: in 50 per cent of the cases there were spontaneous deliveries, in 25 per cent induction of labor, in 12½ per cent vaginal cesarean; 1 case, or 12½ per cent was undelivered. Outcome: 6, or 75 per cent improved; 2 or 25 per cent died, one eight hours after admission, undelivered, the other seven days postpartum, from uremic convulsions; children: 50 per cent alive, 12½ per cent premature, 25 per cent stillborn, 12½ per cent undelivered; average postpartum stay in hospital, thirteen days. If we were confronted with a mild case, rest in bed and the proper dietetic treatment at times enabled us to carry the patient to term without any serious damage to her health; however, in the presence of a severe case, when the mentioned medical treatment was not followed by a prompt and decided improvement, obstetrical intervention was carried out and pregnancy terminated, without consideration as to the viability of the fetus, but with the only aim of protecting and prolonging the mother's life.

GROUP V: HYPEREMESIS GRAVIDARUM

In the last group were included 5 cases, or 10 per cent of the series; the youngest was eighteen, the oldest thirty-two; one was a primipara, and the other 4 were multiparae; the number of pregnancies averaged 3. The previous history was irrelevant, with the exception of acute rheumatic fever, in one case, and gastritis in another; the main symptoms common to all cases were vomiting, progressively more severe and frequent, oliguria, dehydrated condition, secondary anemia with considerable loss of weight and strength, tachycardia; in one case there was an icteroid tinge, and in another marked jaundice and coma almost suggesting the picture of acute yellow atrophy of the liver. Average blood pressure was 102/64 (hypotension). Albumin from 0 to 2 per cent; acetone and diacetic acid in amounts varying from one to four plus; bile in 2 cases; indican in 1; there were pus casts in one case, granular casts in another. Blood chemistry: average findings were sugar, 60 mg.; nonprotein nitrogen, 33.9; uric acid, 1.5; creatinine, 1.25; carbon dioxide, 45 per cent.

Our method of treatment has been that of isolating the patient from the well-meant but disturbing sympathy of the patient's family, and trusting her to a competent nurse; of discontinuance of food and even water by mouth, administration of sedatives as bromides or luminal, glucose by rectum following a low soap-suds enema daily. If the vomiting ceased, fluids were given by mouth and gradually solid food, rich in carbohydrates, was added in small quantities at frequent intervals. In severe cases the intravenous administration of 10 per cent glucose, at times with insulin, proved to be of marked benefit—this is a method originally proposed by Thalhimer¹⁵ and generally adopted in this country and abroad.^{16, 17, 18, 19} When, however, after a reasonable time, the condition of the patient became worse in spite of the treatment, we resorted to obstetric interference. Outcome: 4 out of 5 patients were discharged cured and 1 died. Infants: 4 died (1 of these undelivered); the other one is alive, but unborn as yet.

SUMMARY AND COMMENT

The cases of toxemias considered in this paper represent 2.5 per cent of the 2,023 admissions to the Obstetrical Department in the last six and one-half years. Of the 50 cases, the eclampsia group ranks first with 42 per cent, i.e., 1.05 per cent of the total, followed by the pre-eclampsia, low reserve kidney and nephritis groups each with 16 per cent, or 0.40 per cent of the total, and lastly with the hyperemesis group, with 10 per cent, or 0.25 per cent of the total (see Table I).

TABLE I. INCIDENCE OF TOXEMIAS IN 2,023 ADMISSIONS. (50 CASES, OR 2.50 PER CENT)

| | ECLAMPSIA | PRE-ECLAMPSIA | L. R. K. | NEPHRITIS | HYPER-EMESIS |
|-------------------|-----------|---------------|----------|-----------|--------------|
| No. of cases | 21.0 | 8.0 | 8.0 | 8.0 | 5.0 |
| Per cent of total | 1.05 | 0.40 | 0.40 | 0.40 | 0.25 |

The eclampsia group shows 62 per cent primiparae as against 38 per cent multiparae, while the hyperemesis discloses a percentage four times as high for multiparae as for primiparae. The higher percentage of primiparity in eclampsia is, in our opinion, due to the fact that in the first pregnancy the different body-systems fail to adequately adapt themselves to the demands of the fetal parasite, and respond with an exaggerated abnormal reaction, which resolves itself into the eclamptic attack (*accès eclamptique* of Pinard); in multiparae, on the other hand, there appears to be in action a better mechanism of adaptation between the mother and the fetus, as though a sort of relative immunity had been acquired in a previous pregnancy. In hyperemesis this factor appears to be counterbalanced and often outweighed by other factors (psychic, gynecologic, gastrointestinal, endocrinic, etc.). Again, the only fatal case in this group was that of a primipara, which would seem to justify our assumption.

The period of gestation averages eight months in the eclampsia group as against eight and one half months in preeclampsia and low reserve kidney groups and seven and one-half months in the nephritis group. This suggests that in eclampsia as well as in nephritis the toxemic phenomena usually explode earlier than in preeclampsia and low reserve kidney, probably not only because of a higher concentration and virulence of the toxins, but also of a lower threshold of cerebral irritability in the former, as suggested by the presence of definite psychoses in 9.5 per cent of the eclamptic cases.

The frequent occurrence of a preceding or concomitant general or focal acute infectious disease is common to the first 4 groups, and may be considered as an important factor in the production of renal and hepatic impairment. When this is of severe degree, or of a permanent nature, we are confronted with the graver forms of toxemia; when, however, the impairment is mild and transient, we deal with the so-

called "low reserve kidney" (Stander), i.e., one which, handicapped by some cause, either congenital or acquired, is unable to function at full capacity under the stress and strain of pregnancy. As in such a type the renal parenchyma does not appear to have been injured, to any demonstrable degree, and its function returns practically to normal, within a short period after the termination of pregnancy, we would suggest calling it "miopragic kidney," by which is meant a kidney with decreased activity (*μείων*, less; *πράσσειν*, to perform), and this particular form of toxemia "nephro-miopragia gravidarum."

In the late toxemias we have found a constant increase in the blood pressure (average 181/109), while in hyperemesis a moderate decrease

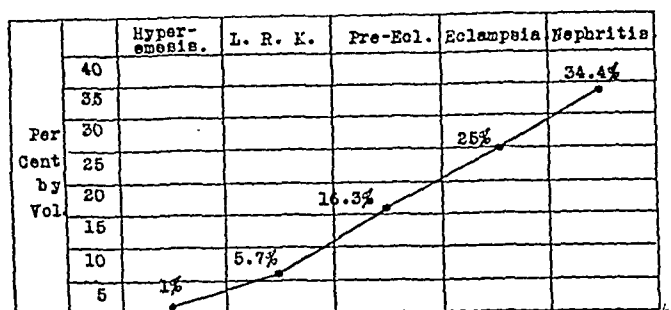


Fig. 2.—Albuminuria.

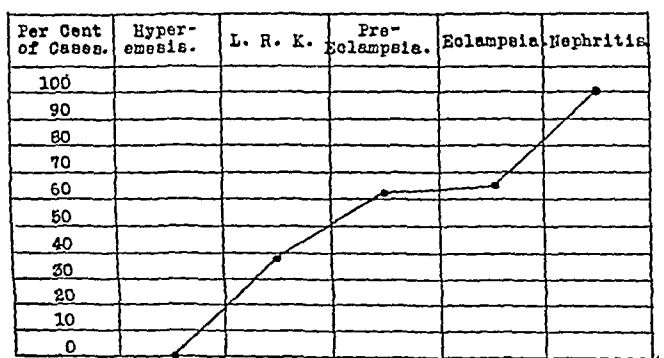


Fig. 3.—Average incidence of cylindruria in toxemia of pregnancy.

has been observed (average 102/64). As to the degree of albuminuria, we have noted a stepladder rise from 1 per cent in hyperemesis to a maximum of 34.4 per cent average in nephritis (see Fig. 2). Likewise the incidence of cylindruria showed a staircase effect (see Fig. 3). Convulsions and coma were found to be constant symptoms of eclampsia, while albuminuric retinitis and nitrogenous retention were characteristic of nephritis. In fact, the nonprotein nitrogen, which in a normal pregnant woman at term is 29 mg., was found to be an average 15.5 mg. higher in the latter group, but almost unchanged in the others. The uric acid was found slightly increased in preeclampsia (2.5 mg.) and still more in nephritis (2.7 mg.) and eclampsia (2.8 mg.), see Table

II. We have not found the high figures met with by some investigators²¹; we, however, agree with Stander and Wetterdal²² that in the severe cases there is a marked increase in uric acid which is of a certain prognostic significance. The carbon dioxide combining power, which in normal conditions of pregnancy is 45 per cent, was found to be low in nephritis (38 mg.), and still lower in eclampsia (27 mg.). Similar findings have been reported by Stander²³ and Voza.²⁴ Again, the last finding has been for us one of the best indices of prognosis, inasmuch as in two cases, one eclamptic and the other nephritic, it was the most important means of predicting a fatal issue. The sugar values were found to average 30 mg. higher than in normal cases, which indicates the presence of a definite hyperglycemia, with the exception of hyperemesis cases which showed practically normal figures; such hyperglycemia may be interpreted as a compensatory one, originating not from the liver, where in two fatal cases of eclampsia Bokelmann and Rother^{25, 26} found no glycogen, but probably from the muscles or kidneys, which, as proved by Brinker,²⁷ may produce large amounts of sugar when placed in acid media, or experimentally in rabbits by increasing the hydrogen ions.

As to the methods of delivery, we shall refer to Table III.

Only a small fraction of the series received prenatal care, the majority being referred to the hospital by physicians and midwives as emergency cases; in the former group we have noted no mortality and less morbidity than in the latter group, which emphasizes the importance of prophylactic treatment during pregnancy.²⁸

TABLE II. COMPARATIVE BLOOD CHEMISTRY IN NORMAL PREGNANCY AND GESTATIONAL TOXEMIAS (AVERAGES)

| MG. PER 100 C.C. | NORMAL PREGNANCY | ECLAMP- SIA | PRE- ECLAMP- SIA | MIO- PRAGIC KIDNEY | NE- PHRITIS | HYPER- EMESIS |
|---------------------|---------------------|----------------|------------------------|--------------------------|----------------|------------------|
| Sugar | 60 | 100.0 | 88.1 | 80.0 | 97.0 | 60.0 |
| Nonprotein Nitrogen | 29 | 29.9 | 32.5 | 31.0 | 44.5 | 33.9 |
| Creatinine | 2 | 1.67 | 1.78 | 1.7 | 2.1 | 1.25 |
| Uric Acid | 2 | 2.8 | 2.5 | --- | 2.7 | 1.5 |
| Carbon Dioxide | 45% | 27.5% | 27.0% | --- | 38.0% | 45.0% |

CONCLUSIONS

1. The classification adopted in this paper seems to be rational and acceptable, because it is based upon definite symptoms, signs and laboratory findings.

2. In this series eclampsia has occurred with higher frequency than in other groups, forming slightly over two-thirds of the total number.

3. Eclampsia is twice as frequent in primiparae as in multiparae; in hyperemesis the incidence is 1 primipara to 4 multiparae; this may be explained on the ground of a lack of adjustment between the maternal

TABLE III. MODE OF DELIVERY AND OUTCOME

| GROUPS | MODE OF DELIVERY | | | OUTCOME | | | | | | | AVERAGE STAY IN HOSPITAL |
|---------------------|------------------|---------|---|----------|------|------|--------|------|------------|------------------|--------------------------------|
| | SPON- TANEOUS | INDUCED | OPERATION | MATERNAL | | | FETAL | | | UNDE- LIVERED | |
| | | | | CURED | IMP. | DIED | LIVING | DIED | STILLBIRTH | | |
| I | 10 | 4 | 7— 4 Low Forceps 1 Midforceps 2 Vaginal Cesarean | 18 | 2 | 1 | 16 | 6 | 0 | 0 | 13.5 days |
| II | 4 | 1 | 3— 2 Low Forceps 1 Version and Ex- traction. | 7 | 1 | 0 | 7 | 0 | 1 | 0 | 12.5 |
| III | 1 | 1 | 6— 4 Low Forceps 2 Abdominal Ces. | 8 | 0 | 0 | 7 | 0 | 1 | 0 | 12.4 |
| IV | 4 | 2 | 1— Vaginal Cesarean Section | 0 | 6 | 2 | 5 | 2 | 0 | 1 | 13.0 |
| V | 0 | 0 | 3— Therapeutic Abortion | 4 | 0 | 1 | 0 | 3 | 0 | 2 | 12.6 |
| Total | 19 | 8 | 20 | 37 | 9 | 4 | 35 | 11 | 2 | 3 | 64.0 |
| Per cent Average | 38 | 16 | 40 | 74 | 18 | 8 | 68.6 | 21.6 | 3.9 | 5.9 | 12.8 |

organism and the fetal or syncytial toxins in the former, while in hyperemesis other factors (psychic, reflex, etc.) seem to exert a preponderating influence.

4. As the low reserve kidney is based only upon functional disturbance, a more appropriate term would be "miopragic kidney," and for the corresponding toxemia, "neophro-miopragia gravidarum."

5. In eclampsia, as well as in nephritis, the period of gestation is shorter than in preeclampsia, or low reserve kidney, denoting the presence in the former not only of a higher degree of intoxication, but also of a lowered threshold of cerebral irritability.

6. The common occurrence of acute infectious diseases in the first four groups bespeaks their importance as a predisposing factor of these toxemias.

7. In eclampsia and in nephritis there is a low carbon dioxide combining power of the blood plasma, indicating the presence of a definite acidosis; this finding is of marked prognostic significance.

8. In the eclamptic and the nephritic groups there is a decided hyperglycemia, which probably is not caused by the liver, but may be a compensatory formation on the part of the muscles or the kidneys.

9. In nephritis, the past medical and obstetric history, as well as the nitrogenous retention in the blood, are of paramount significance, both as regards diagnosis and prognosis.

10. Hypertension is a constant finding in all the toxemias, except in hyperemesis, where instead, there is hypotension; the hypertension and abnormal urinary findings generally disappear during the puerperium in all the toxemias, with the exception of the nephritic group.

11. The keynote of our treatment has been along conservative lines, resorting to obstetric interference in the presence of danger symptoms or signs.

12. In this series there has been an incidence of 38 per cent of spontaneous deliveries, 16 per cent of induced labors, 40 per cent of operative interventions; 6 per cent of the patients were undelivered. The average postpartum stay in the hospital was 12.8 days.

13. The maternal mortality was 8 per cent; the fetal 25.5 per cent—however, if the stillbirths are deducted, the corrected fetal mortality is 21.5 per cent.

14. The better results as to mortality and morbidity in the patients receiving prenatal care emphasize the importance of the prophylactic treatment during pregnancy.

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346 PALISADE AVENUE.

THE DETERMINATION OF FETAL MATURITY IN UTERO

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THE determination of the maturity of the fetus in utero is a problem which not infrequently confronts the obstetrician, and the importance of this problem is manifest when we consider its relation to the induction of labor for such conditions as pregnancy toxemia and other complications arising in the latter weeks of pregnancy.

The methods employed to determine the fetal maturity in utero are, as a rule, both crude and inaccurate. Perhaps the most valuable method at present is that of palpating the fetus through the abdominal wall, a procedure which embraces a considerable amount of speculation. The present communication is an attempt to set forth the value of determining by a roentgenographic method the occipitofrontal diameter of the fetal head in utero, and to point out that such knowledge is of distinct value in determining fetal maturity.

The measuring by roentgenologic means of the occipitofrontal diameter of the fetus in utero is a procedure which has been developed in recent investigations in this Clinic. These investigations were primarily interested in the relationship of the size of the fetal head to the size of the maternal pelvis. The results of this study and the technic employed have recently been published, and to those interested in details, reference is here made.* Briefly, it is an adaptation of the method of roentgen pelvimetry, which we have used successfully for the past few years. In this method, the plane in which any diameter lies must be identified and its distance above the sensitive plate meas-

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ured, in order that the amount of divergence of the roentgen rays may be corrected. In the case of the occipitofrontal diameter, the fetal forehead and occiput must be palpated through the abdominal wall, and their respective distances from the sensitive plate measured. It will be remembered by those familiar with obstetric palpation that the identification of these two portions of the fetal body in the latter weeks of pregnancy is readily accomplished in the majority of cases. The exposure is made with the tube or target at a thirty-six-inch distance, centering as nearly as possible over the parietal region of the fetal head. Following the exposure, the patient is removed from the table, the target and exposed plate remaining in situ. A lead grid with perforations exactly 1 cm. apart is now introduced in the plane



Fig. 1.

previously occupied by the occipitofrontal diameter of the fetal head, and a flash exposure is made on the previously exposed plate. Upon development, not only will the outline of the fetal skull be seen, but also a series of dots (see Fig. 1) representing the centimeter distance. Calculation of the occipitofrontal diameter is readily accomplished by calipers.

It is obvious for the sake of accuracy that the fetal head should be movable at the superior strait. In other words, if the head is deeply and fixedly engaged in either the right or left oblique diameters of the superior strait, the shadow projected on the sensitive plate will be somewhat distorted. Experience has shown, however, that in practically all cases where a knowledge of fetal maturity is desired, no such deep engagement is present, and that the fetal forehead and

occiput are readily palpable through the abdominal wall. Furthermore, as I have pointed out in my previous communications, where the method is used in connection with the diagnosis of disproportion, no such engagement of the fetal head has occurred, else the question of disproportion would not be present. After a little practice in viewing these roentgenograms, one readily discerns the shadow of the anterior and posterior fontanelles, so that any distortion in their proper relationship is readily recognized.

In order to get some idea of the amount of error which might be expected through the use of abdominal palpation to establish the plane in which the occipitofrontal diameter lies, we conducted a series of shadowgraph experiments with a full-term infant skull, a screen, and a reflected light. We placed the fetal skull in such a position that the occipitofrontal diameter was parallel to the screen, with its anterior and posterior end-points at exactly 15 cm. distance from the screen, this representing the average distance of this plane in utero above that of the sensitive plate. The light source was placed 36 inches distance from the screen, centering on the parietal region of the fetal skull. It was found, under these conditions, that the fetal skull could be rotated in either direction 36 degrees before the shadow of the occipitofrontal diameter was shortened a millimeter. Moving the skull forward, still maintaining its parallel position with the screen to a 13 cm. distance, reduced the shadow two millimeters in the occipitofrontal diameter, while moving the skull to 17 cm. distance increased this shadow two millimeters. We, therefore, conclude that our results are accurate to within one or two millimeters. As a matter of fact, in all of the cases where we had had an opportunity to test the method by measuring the occipitofrontal diameter in utero before and extra utero after elective cesarean section, our error has been well within these limits.

A statistical study of a relatively large number of newborn infants has been made, to determine the relationship of the occipitofrontal diameter to fetal length and body weight, and to demonstrate that a knowledge of this diameter gives a practical index to fetal maturity. It is obvious that there is some difference in this diameter between the "molded" and the "unmolded" newborn head. I have therefore included a brief summary of my previous study of 148 infants with "unmolded" heads. It should be borne in mind, however, that excessive molding is usually seen in infants whose weight is more than 3000 grams, and that in infants under this figure, and particularly in premature infants, the effect of molding, when present, is usually slight. In the present study, therefore, the results of 453 newborn infants are reviewed. All infants were born alive and measurements taken within a short time after birth. Only infants

under 3000 grams are included, and in this Clinic, infants under 2500 grams are regarded as premature. The results follow:

RELATION OF CROWN HEEL DISTANCE TO OCCIPITOFRONTAL DIAMETER

Total cases reviewed: 446.

Length 50 to 55 cm. 55 cases, of which 48 cases, or 87.3 per cent, had occip. frontal diameter of 11 cm. or over.

Length 45 to 50 cm. 314 cases, of which 283, or 90.0 per cent, had occip. frontal diameter of 10.5 cm. or over.

Length 40 to 45 cm. 70 cases, of which 51, or 72.8 per cent, had occip. frontal diameter of 9.5 to 10.5 cm.

Length 35 to 40 cm. 7 cases, of which 7, or 100 per cent, had occip. frontal diameter of 7.5 to 9.5 cm.

In this group, therefore, in a total of 446 cases, 369 measured 45 cm. or over. Of these 369 cases, 337, or 91.5 per cent, had an occipitofrontal diameter of 10.5 or more. It is interesting to compare these results with those of my previous study of 148 infants with "unmolded" heads.* In the latter group were infants which were delivered either by cesarean section or breech extraction. Of these 148 infants, 130 were 45 cm. or more in length, while 18 infants were under 45 cm. Of the 130, all showed an occipitofrontal diameter of 10.6 or over, while in all of the 18, the length of the diameter fell below that figure.

It would, therefore, appear from these studies that in a given instance, an occipitofrontal diameter over 10.5 cm. would be evidence of an accompanying crown heel length of 45 cm. or more.

RELATION OF BODY WEIGHT TO OCCIPITOFRONTAL DIAMETER

Total cases reviewed: 453.

Weight 2500 to 3000 gm. 327 cases, of which 264, or 80.9 per cent, had occip. frontal diameter 11 cm. or more.

Weight 2000 to 2500 gm. 81 cases, of which 69, or 85.2 per cent, had occip. frontal diameter 10 to 11 cm.

Weight 1500 to 2000 gm. 39 cases, of which 27, or 69.2 per cent, had occip. frontal diameter 9 to 10 cm.

Weight 1200 to 1500 gm. 6 cases, of which 4, or 66.7 per cent, had occip. frontal diameter 8 to 9 cm.

In analyzing the latter group, we find 327 cases weighing over 2500 grams. In 312, or 95.4 per cent, the occipitofrontal diameter was 10.5 cm. or more. In 126 cases, the weight was under 2500 grams, and of these, 86, or 68.2 per cent, had an occipitofrontal diameter of 10.5 or under. It would, therefore, appear that in instances where the occipitofrontal diameter is over 10.5, we may expect an accompanying body weight over 2500 grams.

*See footnote page 807.

From the figures presented above, we have evidence that in a given instance an intrauterine occipitofrontal diameter of over 10.5 cm. will be accompanied by a crown heel length of over 45 cm., and a body weight of over 2500 grams. Therefore, by determining the occipitofrontal diameter in utero, we have a means of determining intrauterine fetal maturity.

PARALYSIS OF THE BLADDER, WITH DISTENTION AND
HEMORRHAGE IMMEDIATELY FOLLOWING
CATHETERIZATION*

A REPORT OF CASES

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THE literature pertaining to vesical hemorrhage in the female, immediately following catheterization, is not extensive. There has, however, been enough written on the subject of vesical hemorrhage in the male to aid in formulating rules for emptying the bladder in either sex, when this viscus is distended. In an article written by Grelinsky in 1904¹ there are found interesting comments on three cases, previously reported by Guyon, of vesical hemorrhage following catheterization in the male, together with conclusions drawn from the study of these cases and others occurring in his experience. Guyon's conclusions, Albarron agreeing with him, regarding the cause in most cases of vesical hemorrhage following immediate and complete emptying of a distended bladder are first, congestion alone of the blood vessels of the bladder during an attack of retention of urine, and second, congestion aggravated by preexisting lesions. Grelinsky could find no evidence to confirm the conclusion that most vesical hemorrhages, following immediate emptying of a distended bladder, are caused by congestion alone, using the very practical argument that, if this were a fact, vesical hemorrhage should be far more frequent, as most physicians empty a distended bladder immediately upon its discovery. Further, he is of the opinion that vesical hemorrhage, following immediate and complete emptying of a distended bladder, is caused not by congestion, the result of mechanical distention, but by some chronic lesion prior to the retention. The amount of urine drawn is not mentioned in Grelinsky's comment on Guyon's three cases, nor is the operative procedure described as clearly as one might wish. However, it is fair to assume that Guyon followed his rule of emptying the bladder slowly. Yet all of these patients died. Further, autopsies showed prostatic or vesical pathology in all of them.

*Presented by title at the Fifty-fifth Annual Meeting of the American Gynecological Society, May 20, 1930.

One year after the publication of Grelinsky's article, an interesting prize essay was written by A. Coperman,² on retention of urine. In a summary regarding treatment he states that the bladder should be emptied slowly, to avoid the possibility of syncope supervening, and that a considerable amount of urine should be left behind, to which some warm boric acid solution should be added. Neglect of this precaution has led to severe hemorrhage into the kidneys and bladder, and even to death.

There are to be found in literature many cases of extreme distention in the female, which support Grelinsky's conclusion that most vesical hemorrhages, following immediate emptying of a distended bladder, are not caused by congestion alone, but are the result of some chronic lesion existing prior to retention.

I have reviewed the literature on this subject for the past twenty years, to see what bearing it has upon the correctness of Grelinsky's observations, and have assembled, I believe, a sufficient number of cases to prove the soundness of his findings.

CASES FOUND IN LITERATURE BEARING ON THE SUBJECT

CASE 1.—Paralysis of the bladder. The patient was operated upon under the diagnosis of ovarian cyst with twisted pedicle. (This condition followed normal delivery.)

A female, thirty years of age; she had had three previous normal deliveries; patient was in the second stage of labor when first seen; normal child was delivered without forceps and without laceration of the vaginal tissues. Normal third stage. First six days after delivery the patient's condition was normal. On sixth day the uterus was six fingerbreadths above the pelvis. Urine normal. On the seventh day temperature rose to 102° F., pulse 120. Patient complained of severe abdominal pain, especially on right side. Abdomen began to swell rapidly on this side, simulating in size a six months' pregnancy. A normal amount of urine was being passed, although there was some irritability of the bladder. On the eighth day temperature was 103° F., pulse 140. Puerperal sepsis was suspected. Pain was controlled by one-quarter grain of morphine as necessary. By that time the size of the abdomen resembled a full-term pregnancy. Percussion showed a large, cystic tumor. Diagnosis then made was ovarian cyst with twisted pedicle, accompanied by pelvic infection. Abdominal section was advised and immediately done. Urine was being passed every two or four hours, in quantities of from four to six ounces. Just before the abdominal section was made, the patient passed eight ounces of urine, and it was not thought necessary to pass a catheter. On opening the abdomen, a large, blue, thin-walled tumor which resembled an ordinary cyst was found. A puncture through its wall was made with a trocar, and three gallons (or 380 ounces) of urine were withdrawn. Both abdominal and bladder wound healed by primary union. No blood was noted in the urine when drawn. Patient was catheterized three hours after operation and three times a day thereafter. On the fifth day the bladder was found to be infected. Kidneys also became infected, but patient recovered.

CASE 2.—Retention of urine for eleven days. The patient was a Chinese woman, twenty-one years of age. She had given birth to a medium-sized child eleven days previous to the time she was seen by Dr. McCartheny, and from the time of delivery until then she had not passed urine, with the exception of a little dribbling

now and again, but had a constant desire to micturate. The abdomen was distended to the size of a full-term pregnancy, and she had a continuous pain in the lower abdominal region. She was catheterized by Dr. McCartheney and the urine was expelled with great force. He states that more than six and one-half quarts (or 208 ounces) were drawn. In this instance there was no bleeding. The patient recovered.

CASE 3.—A case of retention of urine. Female, married, age thirty-seven. She was well until fourteen days previous to her admission to the hospital, when she developed symptoms of nausea, vomiting, pelvic pain and difficulty in micturating, although passing a normal quantity of urine. Symptoms disappeared in twenty-four hours. Eleven days later pain recurred and was very severe. She passed urine only in small quantities, and then with great difficulty. She also noticed that her abdomen was getting larger.

When admitted to the hospital, the patient was in a comatose condition, breath offensive, skin cold and clammy, pulse feeble, temperature subnormal and respiration shallow. Inspection showed a large abdominal tumor completely filling the hypogastric and umbilical areas, prominent on the right side. Upper level of tumor was between umbilicus and sternum, to the right of the median line. Tumor was slightly movable but gave no fluid thrill and was dull on percussion. Flanks were resonant. Mass with definite limits was outlined in Douglas' culdesac. Examination by rectum revealed a mass, seemingly independent of the tumor, which was considered a retroflexed uterus.

Treatment.—A catheter was passed with difficulty, because of lengthened urethra. A stream began to flow at very high pressure, clear, and not offensive. All the urine, consisting of 166 ounces, was withdrawn at one sitting; no bleeding.

Abdominal tumor disappeared. An attempt was made to reduce the pelvic mass, but this was found impossible. An anesthetic was then administered and, with two fingers in the rectum, the uterus was replaced and a pessary inserted in the vagina. The uremia was treated with saline infusion, digitalis, warmth, etc. A catheter was passed every four hours and, at first passage, 56 ounces of urine were withdrawn.

The patient's general condition gradually improved; bowels became active, she perspired freely and consciousness returned, though some delirium was present. Forty-eight hours after admission she passed urine normally and became quite conscious. On further examination of the abdomen a pregnant uterus was palpable to the umbilicus. Seven days afterward the patient was out of bed, feeling well. Position of uterus maintained with pessary. Patient was discharged cured fourteen days after admission.

CASE 4.—Distention of the bladder mistaken for an ovarian cyst. A diagnosis of ovarian tumor was made by the patient's family medical attendant, corroborated by Dr. DaCosta. It was further stated that "there was no trouble with the urine, which she passed easily, but that there was severe constipation and pain from the growth of the tumor." Examination showed an oval tumor in the median line of the abdomen, dull on percussion, with a clear note in the flanks. A catheter was passed and 60 ounces of urine were evacuated. Two hours later 20 ounces more were withdrawn. There was no bleeding. Patient recovered.

CASE 5.—Prolonged retention of urine. Female, twenty-seven years of age; three months pregnant. For no apparent reason she had a retention of urine, with pain and great distention in the lower abdomen. Twenty-four hours had passed without urinating. Catheter was passed and 52 ounces of urine withdrawn. No bleeding followed. After several days retention again occurred and catheter was again used to relieve the patient. Soon after this an abortion occurred, after which retention ceased.

Dr. N. G. Bozman, in discussing this case, states that he has seen several cases of severe retention, one of these mistaken for an ovarian tumor, and that the attending physician aspirated the fluctuating body found posterior to the uterus. He further comments that the uterus maintained an anterior position and the distended bladder fell over the fundus, filling the culdesac. A large basin full of urine was drawn off. No bleeding was noted in the report.

6. Author's case. The patient whose history forms the basis of this article was admitted to the Woman's Hospital on February 18, 1927, with the diagnosis of a large ovarian cyst. I saw her a few hours after her admission. Abdominal examination showed a very large cystic body, extending from the pelvis to the right costal border, somewhat irregular in shape above the navel, but symmetrical below. Vaginal examination revealed a tense, cystic body, completely filling the pelvic cavity and crowding the pelvic organs forward. Patient was thirty-eight years of age. Her chief complaint was pain in the lower left quadrant, severe for two days previous to admission, and accompanied by vomiting. Several years prior to this an abdominal section had been performed. One ovary had been removed, but she did not know which. For three months previous to her admission she urinated every hour. The act was frequently accompanied by a bearing down sensation and, occasionally, by vomiting. She was poorly nourished and had lost thirty pounds during the year.

A few hours before her examination by me, 20 ounces of urine were withdrawn, per catheter, by a nurse. The existence of a large, cystic body was self-evident, but its origin was doubtful. The question, of course, immediately arose as to whether or not the 20 ounces of urine withdrawn constituted the entire contents of the bladder, but, on passing a catheter, it became evident by the diminution in size of the cystic body that we were dealing with an overdistended bladder.

Sixty-two ounces of urine were then withdrawn, making, with the 20 ounces withdrawn a few hours before, 82 ounces. A little blood was noted in the last few ounces, but the bleeding rapidly increased. It was determined, in consultation with the Urological Department, to allow the bleeding to continue, with the hope that clotting and internal vesical pressure would stop it. After a few hours the patient became exsanguinated and transfusion was necessitated. A suprapubic cystotomy was then done and the clotted contents of a greatly distended bladder were removed. The bladder wall was extremely thick and its fundus was sacculated over the uterus, filling the sacral region of the pelvis. After removing the clots, blood could be clearly seen oozing from every fraction of an inch of the vesical mucosa. There was no possibility of controlling the hemorrhage by the use of sutures, so packing the viscera with many long strips of iodoformed gauze was resorted to. This was done with patience and exactness, so as to insure direct pressure upon every portion of the extensive bleeding surface.

Postoperative care of the patient consisted in the gradual removal of the gauze strips, until, at the end of seven days they were entirely withdrawn, and the bladder, contracting proportionately, at no time bled. A Sims's sigmoid catheter was then passed through the urethra to establish vesical drainage. The abdominal wound closed and opened several times during patient's convalescence, and as she could not void because of paralysis of the bladder, it was eventually found necessary to teach her to pass the catheter on herself. This she successfully did, and at the last report received from her, about a year after the operation, she was still obliged to resort to this method for relief.

The interesting features of this patient's history are the size of the distended bladder, the amount of vesical hemorrhage, the thickness of the bladder wall, making it seem a large pelvic tumor, even after its complete evacuation, the congestion of the entire vesical mucosa, the sacculatation of the fundus of the bladder

as it fell over the uterus, filling the posterior pelvis, the positive four-plus Wassermann reaction, and the persistent paralysis of the bladder, in spite of the anti-syphilitic treatment.

CONCLUSION

In my experience of more than forty years I have encountered only four cases of marked distention of the bladder. From the first 50 ounces of urine were withdrawn immediately before operating for a fibroid; from the second 54 ounces a few days after an abdominal section had been performed for the removal of large, bilateral, ovarian tumors; from the third, upon whom no operation was performed, 58 ounces, and from the fourth, which forms the subject of this article, 82 ounces of urine were withdrawn. In three of these cases no hemorrhage followed catheterization and, in view of the fact that in the fourth case, where vesical hemorrhage did occur, four-plus Wassermann was definitely determined, and that there was also a history of distention for three months or more, it would seem correct to conclude that the cause of distention, in this case, was paralysis of the bladder, dependent upon a lesion of the spinal cord, which was the result of syphilis. Moreover, unlike the three other cases, this distention was of long duration, and could correctly be considered chronic. This leads us to the conclusion which is in accord with Grelinsky's findings that, in acute distention, bleeding does not follow complete emptying of the bladder, but might, and commonly does, in the chronic form, because of a lesion existing prior to retention.

In view of these conclusions, what course should be followed when confronted with an emergency case with an indefinite history? Under these circumstances I think it would be well to follow Guyon's advice, in a modified manner, and empty the bladder gradually, and, if the patient be a female, a mushroom catheter might be placed in the bladder and the urine allowed to escape, using a regulating clasp, as is used in the Murphy drip, to control the amount of flow. The amount of flow every hour should be in excess of the average quantity excreted by the average individual. Should one and one-half ounces per hour be found not to diminish the distended bladder within five or six hours, then the clasp should be regulated to allow a flow which will appreciably reduce the size of the distended bladder during a specified time.

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MATERNAL MORTALITY IN THE JEWISH HOSPITAL OF BROOKLYN*

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AT THE Jewish Hospital of Brooklyn from its opening on December 9, 1906, to December 31, 1929, a period of a little over twenty-three years, 24,217 deliveries occurred. During this period 163 mothers died. Of these 27 were delivered at home and brought to the hospital with sepsis, and 20 patients were admitted *in extremis* and died shortly after admission, many of them undelivered. Excluding these 47 cases we have 116 women who died while under our care, or 4.5 per thousand. The accompanying table gives the number of deliveries and gross deaths for each year.

TABLE 1

| YEAR | CASES | DEATHS | PER CENT | YEAR | CASES | DEATHS | PER CENT |
|------|-------|--------|----------|------|-------|--------|----------|
| 1906 | 9 | 0 | 0.0 | 1918 | 930 | 8 | 0.86 |
| 1907 | 91 | 4 | 4.39 | 1919 | 908 | 4 | 0.44 |
| 1908 | 213 | 15 | 7.04 | 1920 | 932 | 8 | 0.85 |
| 1909 | 325 | 11 | 3.38 | 1921 | 955 | 6 | 0.53 |
| 1910 | 444 | 6 | 1.35 | 1922 | 1031 | 5 | 0.48 |
| 1911 | 518 | 14 | 2.70 | 1923 | 1167 | 5 | 0.43 |
| 1912 | 543 | 6 | 1.10 | 1924 | 1555 | 3 | 0.19 |
| 1913 | 587 | 4 | 0.68 | 1925 | 1872 | 5 | 0.26 |
| 1914 | 719 | 10 | 1.37 | 1926 | 2057 | 7 | 0.34 |
| 1915 | 767 | 7 | 0.91 | 1927 | 2355 | 7 | 0.29 |
| 1916 | 751 | 6 | 0.79 | 1928 | 2293 | 5 | 0.22 |
| 1917 | 963 | 10 | 0.91 | 1929 | 2232 | 7 | 0.31 |

Certain important points are brought out by a study of this table. First, the high rate in the years 1907 to 1912 is accounted for by the large number of cases brought into the hospital moribund or septic after delivery at home; second, the lowering death rate in the period 1912 to 1923 represents the improvement in obstetrics both in the hospital and at home and includes the period after the abandonment of accouchement forcé; third, the period from 1923 on represents the period of prenatal care with its lowered maternal mortality. The increase in the total number of patients admitted since the establishment of the prenatal clinic proves definitely that the public is seeking such care, and, in addition, the better care during labor which hospitalization affords. The rapid decrease in the number of septic cases brought to the hospital after delivery at home is the most eloquent proof that

*Read at a meeting of the Brooklyn Gynecological Society, April, 1930.

better obstetrics is being done by the mass of the profession. Likewise, the rarity of the case that is brought to the hospital *in extremis* as a result of cardiac disease, eclampsia, or placenta previa can be explained in the same manner.

Dividing the entire period covered by this study into four six-year periods reveals the following:

| | | | |
|------------|-------------|-----------|-------------------|
| 1906 to 11 | 1600 cases | 50 deaths | 31.2 per thousand |
| 1912 to 17 | 4330 cases | 43 deaths | 9.0 per thousand |
| 1918 to 23 | 5923 cases | 36 deaths | 6.6 per thousand |
| 1924 to 29 | 12364 cases | 34 deaths | 2.7 per thousand |

Grouping the fatal cases according to the actual cause of death we find the following:

| | | |
|--------------------------------|----------|---------------|
| Sepsis | 48 cases | 29.4 per cent |
| Hemorrhage | 33 cases | 20.2 per cent |
| Eclampsia | 18 cases | 11.0 per cent |
| Peritonitis | 17 cases | 10.4 per cent |
| Cardiac disease | 11 cases | 6.7 per cent |
| Ruptured uterus | 9 cases | 5.5 per cent |
| Embolus, pulmonary or cerebral | 8 cases | 4.9 per cent |
| Pneumonia, all types | 5 cases | 3.0 per cent |
| Cerebral hemorrhage | 2 cases | 1.2 per cent |
| Hyperemesis gravidarum | 1 case | 0.6 per cent |
| Uremia | 1 case | |
| Strangulated fibroid, shock | 1 case | |
| Tuberculous meningitis | 1 case | |
| Chloroform anesthesia (?) | 1 case | |
| Purpura hemorrhagica | 1 case | |
| Diabetes mellitus | 1 case | |
| Coronary thrombosis | 1 case | |
| Carcinoma of bladder | 1 case | |
| Unknown (charts missing) | 3 cases | |

From a study of this list we find that infection caused about 40 per cent of all the deaths; infection, hemorrhage, and eclampsia together caused 71 per cent of all the deaths; cardiac disease, embolism, and rupture of the uterus caused 17 per cent of all the deaths. Taken together, conditions which we are all agreed are preventable are the cause of death of 144 patients, constituting 88 per cent of all the mortality in the past twenty-three years. How these deaths can be avoided will be taken up under individual groups.

According to the method of delivery (Table II) we find that:

- 55 cases died after spontaneous delivery
- 39 cases died after forceps delivery
- 20 cases died after version and breech extraction
- 18 cases died after abdominal section
- 10 cases died undelivered
- 7 cases died after craniotomy
- 6 cases died after vaginal section
- 3 cases died, method not recorded

- 3 cases died, charts missing
- 1 case died after decapitation
- 1 case died after Porro section

Sepsis always was, and still is, the center of attraction in the field of prevention. In the past years numerous methods of reducing this dread complication have been proposed. First and foremost stands rectal examination—a fallacy slowly but surely being exposed. The ease with which it can be done, coupled with the fact that the examiner really believes that he cannot infect his patient because the examining finger is not in the vagina, recommends this method. That it is easy, convenient, and timesaving is undoubtedly true; that is perhaps the reason why it has been so universally adopted where students are concerned. However, just as great care must be exercised in rectal as in vaginal examination. Many unclean fingers are inserted into the lower part of the vagina during rectal examinations; also, the invagination of the rectovaginal septum into and through the cervix in an attempt to gain too much information as to the presentation and position of the presenting part carries the vaginal secretion with its flora of bacteria into the lower uterine segment. On the other hand, a vaginal examination under strict asepsis to determine the degree of effacement and dilatation of the cervix and the presence or absence of the membranes carries with it a minimum element of danger provided that the examiner stops there and does not pass the finger into the lower segment in an attempt to determine the position of the presenting part. We are sure that competent obstetricians will always rely on vaginal examination and will have no hesitancy in doing so whenever the necessity arises.

The use of vaginal instillation of antiseptics during labor is another method of prevention of sepsis which has lately been offered. How the rectal enthusiast can permit the vaginal manipulation necessary for the instillation of these so-called antiseptics is a question which we believe must still be answered. Recently, this procedure was carried out at the Jewish Hospital for many months, mercurochrome being used; and in the final analysis was found to be of no value and was given up.

In the performance of cesarean section we have heard a great deal in recent years about the two-flap or trachelo-hysterotomy as being the only safe method of performing this operation, and especially so in the so-called potentially infected cases. Just what a potentially infected case is we have not yet been able to determine; on the contrary, we have records of cases in which the membranes have been ruptured for several days, with numerous vaginal examinations (in some cases through unshaved vulvae), elevation of temperature, and distinct infection of the amniotic fluid, with uneventful recovery after classical cesarean section. At the Jewish Hospital classical section is

TABLE II

| METHOD OF DELIVERY AND CAUSE OF DEATH IN EACH GROUP | TOTAL | CAUSES OF DEATH | | | | | | | | | | | | | | | | CHARTS MISSING |
|---|-------|-----------------|------------|-----------|---------|---------|----------|----------|------------|-----------|-------------|-------------------------|--------------------|-------------------------|---------------------|-------------------------|-------------------------|----------------|
| | | SEPSIS | HEMORRHAGE | ECLAMPSIA | CARDIAC | TOXEMIA | DIABETES | EMBOLISM | MENINGITIS | PNEUMONIA | PERITONITIS | CHLOROFORM POISONING | RUPTURED UTERUS | PURPURA HEMORRHAGICA | CORONARY CLOSURE | CARCINOMA OF BLADDER | STRANGULATED FIBROID | |
| Spontaneous | 55 | 25 | 7 | 9 | 4 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | | | |
| Forceps | 39 | 17 | 5 | 4 | 2 | | | 4 | | 1 | 1 | | 3 | 1 | | | 1 | |
| Version-extraction | 20 | 2 | 11 | 1 | | | | 1 | | | 1 | | 5 | | | | | |
| Vaginal cesarean | 6 | | 1 | 2 | 1 | | | | | | 2 | | | | | | | |
| Abdominal cesarean | 18 | | 4 | | | | | | | 2 | 12 | | | | | | | |
| Craniotomy | 7 | 2 | 2 | 1 | | | | | | | 1 | | 1 | | | | | |
| Decapitation | 1 | | | | | | | | | | | | 1 | | | | | |
| Porro cesarean | 1 | | | | | | | | | | | | | | | | | |
| Undelivered | 10 | 1 | 1 | 1 | 4 | 2 | | 1 | | | | | | | | 1 | | |
| Method unrecorded | 3 | 1 | 2 | | | | | | | | | | | | | | | |
| Charts missing | 3 | | | | | | | | | | | | | | | | | 3 |
| Total | 163 | 48 | 33 | 18 | 11 | 4 | 1 | 8 | 1 | 5 | 17 | 1 | 9 | 1 | 1 | 1 | 1 | 3 |

the rule, but in the past ten years we have gotten away from the time-honored method of closing the uterus with interrupted sutures and have substituted three layers of continuous sutures. This method of closure is practically an absolute guarantee against seepage. Piper and Bachman have recently laid stress on the importance of this method of closure. Other writers have made comparative studies of classical *versus* two-flap section, reporting far better results in the latter, but they do not tell us that in the statistics for classical sections every operator's cases were used, whereas, in the two-flap statistics only the cases done by themselves or their well-trained staffs were included; this we consider an unfair comparison. The use of spinal anesthesia which prevents the extrusion of the abdominal contents and reduces hemorrhage aids materially the postoperative course.

The reduction of intra-uterine manipulation to a minimum is, we believe, one of the greatest factors in the control of sepsis and the rule that "the hand once inserted into the uterus must not be withdrawn until its object has been accomplished" must be strictly observed.

Hemorrhage as a cause of death is absolute proof that the case has not been properly handled. In placenta previa the means of controlling bleeding are too well known to require reiteration and if the obstetrician will bear in mind that all that is demanded of him is to control this bleeding, an immediate reduction in mortality from this cause will be accomplished. The desire to empty the uterus rapidly with its resultant rupture of the cervix and possibly the lower uterine segment is the cause of death in these cases. The Pomeroy bag was short-lived but caused numerous deaths before it was discarded; manual dilatation (?) with its resulting laceration did the rest, and yet only recently articles have appeared in the French literature proving that accouchement forcé is still a common practice. The desire for a live baby leads many obstetricians to do an immediate extraction after a Braxton-Hicks version even though the cervix is incompletely dilated, and we find that Williamson has recently advocated this procedure.

In our series placenta previa occurred 234 times, once in 103 cases—15 mothers died, or 6.41 per cent. Four of these cases were of the central type; 12 patients died of hemorrhage and 3 of sepsis; 7 of these deaths resulted in cases in which manual dilatation, version, or breech extraction had been included in the method of handling the cases; all of these 7 patients died of hemorrhage.

Another type of hemorrhage resulting in death occurs when the uterus is emptied while in a state of atony from secondary inertia and cannot occur if the case is tided over until uterine contractions are reestablished; this is accomplished by a thorough rest of the patient with subsequent stimulation and, if necessary, forceps delivery when good contractions have been produced.

The last word on the treatment of eclampsia is still to be written; but, in a general way we incline to the immediate termination of the pregnancy when this condition exists. If the patient is a primipara, at or near term, with a live baby and no evidence of labor being present, we believe cesarean section is justified. All other cases can be carried through a vaginal delivery under morphine. The absolute refusal to induce labor immediately or soon after the convulsions have been controlled is fraught with the possibility of maternal death. In a review of eclampsia at the Johns Hopkins Hospital from 1894 to 1924 Wilson divided the cases into two groups. From 1894 to 1912 there were 110 cases while in the second period they had 137 cases. The death rate in the postpartum eclampsia was practically the same, but for the ante- and intrapartum cases he reported a reduction of the death rate of almost 50 per cent. He concludes that the conservative method of treatment is responsible for the reduction in the death rate, but a study of this report shows that manual dilatation and other methods of rapid dilatation of the cervix and emptying of the uterus were used rather frequently in the first group while in the latter group accouchement forcé was not used. Again, in the latter group 5 women were allowed to die undelivered. We are firmly opposed to allowing these mothers to die undelivered unless admitted to the hospital *in extremis*.

In our series of cases eclampsia occurred 148 times or once in 163 cases. Of these, 118 were ante- or intrapartum and 30 were postpartum, with 18 deaths in the former and 4 deaths in the latter. Of the 22 patients who died, 8 were admitted to the hospital moribund and died in the first twenty-four hours, most of them in the first ten hours after admission. Our corrected mortality is therefore 9.46 per cent, while the gross mortality is 14.86 per cent.

TABLE III. TYPE OF DELIVERY AND CAUSES OF DEATH

| | ECLAMPSIA | HEMORRHAGE | PNEUMONIA | PERITONITIS |
|--|-----------|------------|-----------|-------------|
| Spontaneous delivery | 6 | | | |
| Bag and spontaneous | 2 | | | |
| Forceps | 2 | | | |
| Bag and forceps | 2 | | | |
| Cesarean section | | 1 | 1 | |
| Vaginal section | 2 | | | 1 |
| Manual dilatation, version, extraction | | 1 | | |
| Manual dilatation, craniotomy | | 1 | | |
| Dührsen incisions, version, extraction | 1 | | | |
| Craniotomy | 1 | | | |
| Undelivered | 1 | | | |

Cesarean section was performed 565 times, or once in every 42 cases. There were 18 maternal deaths, or 3.18 per cent.

Classical sections 529; 16 deaths, or 3.0 per cent
Two-flap sections 36; 2 deaths, or 5.5 per cent
4 deaths were caused by hemorrhage (2 low flap)
2 deaths were caused by postoperative pneumonia
12 deaths were caused by peritonitis
3 deaths followed elective section
2 deaths followed eclampsia

Of the 10 patients that died undelivered, 4 had cardiac disease with decompensation, 1 had fulminating eclampsia, 1 had placenta previa, and 1 had a pulmonary embolus; these 7 patients were admitted *in extremis* and died in less than twenty-four hours. Of the remaining 3, septic thrombophlebitis and pneumonia after the introduction of a bag for toxemia, cerebral hemorrhage after ablatio placentae, and pernicious vomiting acidosis after eight days of medical treatment, were the causes of death.

(For discussion, see page 864.)

THE HYDROGEN-ION CONCENTRATION OF THE BLOOD IN ECLAMPSIA

BY H. J. STANDER, M.D., AND N. J. EASTMAN, M.D., BALTIMORE, MD.

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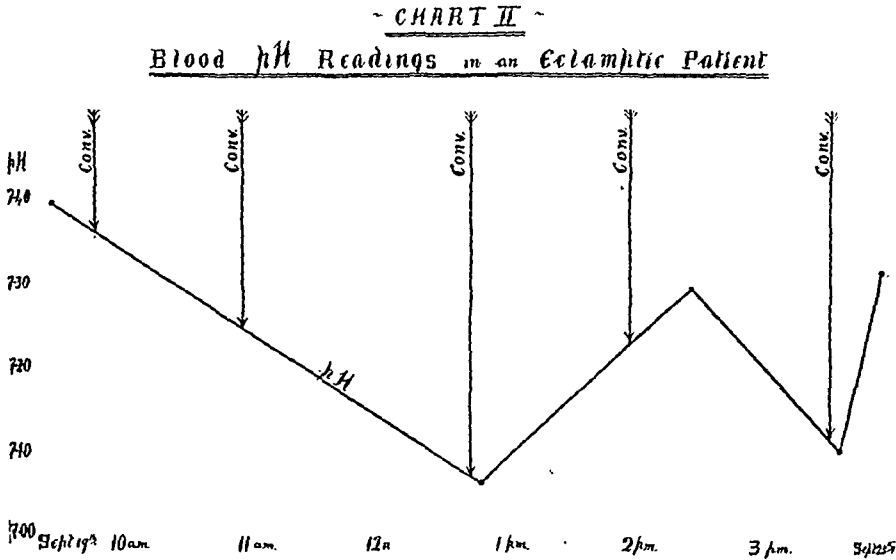
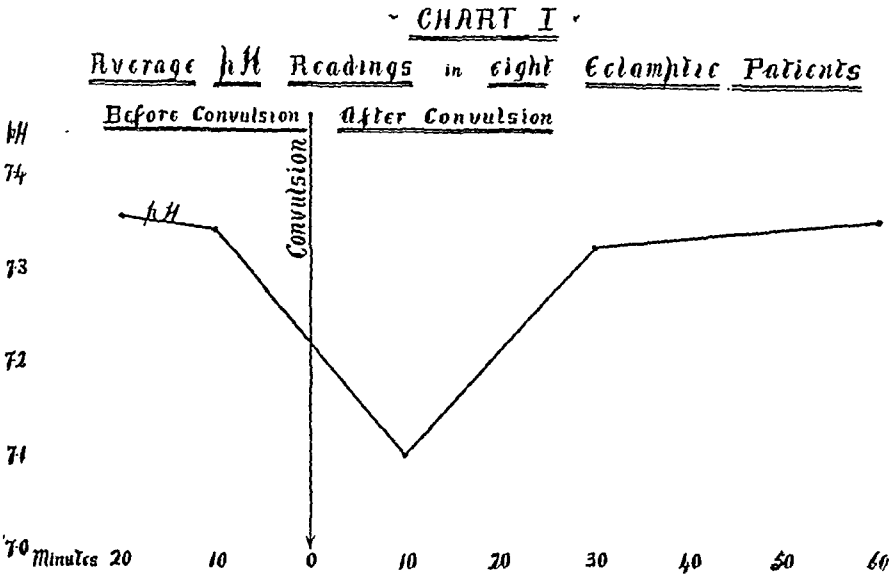
THE previously reported changes^{1, 2} in the acid base equilibrium of the blood in eclampsia were so marked that we have continued this study and have directed our attention particularly to the behavior of the hydrogen-ion concentration in its time relation to the convulsion. As stated in previous publications, we believe that eclampsia at the time of convulsions is associated with a true acidosis, due to an uncompensated alkali deficit, as is demonstrated by a definite increase in the hydrogen-ion concentration. We, furthermore, stated that the acidosis probably should not be regarded as a causal factor, but rather as the result of the eclamptic convulsion, and by itself it is sometimes severe enough to cause death.

A study of eight additional cases of eclampsia has strengthened this view, and has furnished more specific information concerning the relationship between the convulsion and the P_H of the blood. We have endeavored to determine the reaction of the blood immediately before and after an eclamptic fit, as well as over a period of time during the continuance of the convulsive seizures.

The technic employed in obtaining blood specimens and the methods of analysis used are the same as those described in our earlier papers.

RESULTS

In Table I are given the P_H readings, corrected to 38°C ., in eight eclamptic patients at various times with regard to a convulsion. Some of these readings were made on blood samples obtained within one minute before or following a fit. These findings have been grouped in



periods of ten minutes before, and ten minutes, thirty minutes, and one hour after a convulsion. In Chart I the averages of the P_H readings are shown graphically, and cover a period starting twenty minutes before and ending one hour after the fit.

In one patient, Case 1, we were able to obtain six separate determinations, and these are represented in Chart II.

Whenever we were able to obtain a blood specimen within a few minutes after an eclamptic convulsion, the hydrogen-ion concentration revealed an increase, which was usually marked enough to signify a true acidosis. Following the drop in the blood P_H immediately after the fit, the blood tends to regain its normal hydrogen-ion concentration; and in most of our cases this was accomplished before the next succeeding convulsion occurred.

DISCUSSION

In this paper we are not reporting blood bicarbonate values, although in every instance this was determined simultaneously with the P_H reading. It may, however, be stated that the blood bicarbonate, or alkali reserve, followed closely in reverse ratio to the hydrogen-ion concentration, and this is in keeping with our earlier findings in severe eclampsia.

In cases of mild eclampsia we noted less marked deviations from normal in the hydrogen-ion concentration; and furthermore the blood reaction was restored to normal within thirty to forty minutes following the fit. Although we report in Table I three cases of eclampsia in which the blood P_H did not fall below the lower limit of normal, it appears that most, if not all, eclamptic patients will present an acidosis if studied within two minutes following a convulsion. The eclamptic patient undoubtedly attempts to overcome the marked acidosis seen immediately after a convulsive seizure, and should this not be accomplished she must inevitably succumb, as it is inconceivable that life processes can long continue in the presence of a blood P_H below 7.10. Fortunately, most eclamptic patients are able to restore their blood reaction to approximately normal limits by lowering the carbonic acid by means of deepened breathing, so that it is only the occa-

TABLE I. HYDROGEN-ION READINGS IN ECLAMPSIA

| CASE NO. | BLOOD P_H | | | |
|----------|------------------------------------|-----------------------------------|---|--------------------------------------|
| | TEN MIN. OR LESS BEFORE CONVUL. | TEN MIN. OR LESS AFTER CONVUL. | THIRTY MIN. OR MORE AFTER CONVUL. | ONE HOUR OR MORE AFTER CONVUL. |
| 1 | 7.39 | 7.10 | | |
| 2 | 7.25 | 7.07 | | |
| 3 | | | | 7.42 |
| 4 | | 7.10 | | |
| 5 | | | | 7.25 |
| 6 | 7.39 | | 7.39 | 7.39 |
| 7 | | | | 7.47 |
| 8 | | 7.13 | 7.25 | |
| Average | 7.34 | 7.10 | 7.32 | 7.38 |

sional woman who needs assistance in the shape of alkali therapy to overcome these periods of marked true acidosis. As was stated previously, when it is impossible to follow accurately the P_H of the blood,

the CO_2 combining power of the serum affords an approximate index of the acid-base equilibrium, and the latter should be closely followed in all cases of eclampsia, and particularly when the coma is persistent. The increase in lactic acid, as well as the high organic acids¹ in the blood of eclamptic patients, suggests that abnormal acid accumulation is the underlying cause of the acidosis. We have previously referred to the changes in the carbohydrate chain incident to muscular work, which involves the production of lactic acid.

CONCLUSIONS

1. Immediately following an eclamptic convulsion, the hydrogen-ion concentration of the blood usually increases, and often to the level of a true acidosis.

2. Usually the eclamptic patient overcomes this by such means as lowering the carbonic acid through deepened breathing, with the result that the periods of acidosis following convulsions are transitory.

3. When the patient is unable to overcome the acidosis, death may result unless antiacidosis treatment be instituted.

4. The CO_2 combining power of the blood is a fairly good index of the acid-base equilibrium, and should be closely followed in all eclamptic patients, when laboratory facilities are available.

5. From previous work on lactic and other organic acids in the blood of eclamptic patients, it is probable that these periods of acidosis result from accumulation of these acids following the muscular work incident to the convulsion.

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Henning, M. P.: Remarks on Congenital and Acquired Deafmutism. Acta Obst. et Gynec. Scandinav. 8: 132, 1928.

It is frequently difficult to decide whether deafmutism is acquired or congenital. The recent investigations of Schwartz and Voss have demonstrated that trauma at parturition can affect the brain and ears in such a way as to produce deafness. In the newborn and very young infant, the Eustachian tube is short and wide, hence inflammation of the ears readily occurs. Such infections may occur shortly after birth hence it is recommended by some authors that the secretion shall be removed not only from the throat but also from the nose of every newborn and there should be disinfection not only of the eyes but also of the nose by some silver preparation such as argyrol. The argyrol should be instilled daily for the first eight days.

J. P. GREENHILL.

THE CARBON DIOXIDE CONTENT OF THE BLOOD IN THE NEWBORN

A PRELIMINARY REPORT

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DURING the development of the apparatus for the resuscitation of the asphyxiated newborn which was described by Kreiselman, Kane and Swope in 1928, it became necessary to decide upon the relative merits of oxygen and oxygen-carbon dioxide as resuscitating agents. Acknowledging the beneficial effects of the combination of carbon dioxide with oxygen in adult asphyxia, it seemed doubtful that asphyxia neonatorum presented the same pathologic conditions or that it called for stimulation of the respiratory centers by means of carbon dioxide.

In the experiments it was found that pure oxygen, instilled into the lungs, and taken up by the blood stream was sufficient to initiate respiration in all cases in which no intracranial damage had been sustained. In a few cases a combination of 5 per cent carbon dioxide and 95 per cent oxygen was employed with no difference in clinical results.

With the cooperation of Drs. Oscar B. Hunter and Tomas Cajigas of the Department of Pathology of the George Washington University, the carbon dioxide content of the blood of forty-seven newborn infants was determined.

Blood was taken from the cord which was cut as soon as possible after delivery. In order to avoid contamination of the blood by air, the cord was severed six inches from the abdomen and the end immediately submerged beneath a layer, one-half centimeter deep, of mineral oil in a small wide-mouthed bottle. This layer of oil sealed the specimen while it was being collected. Many specimens were not satisfactory due to the practical difficulty encountered in holding under the surface of the oil, a slippery cord one end of which was attached to an actively moving infant. Frequently, too, only one or two cubic centimeters could be obtained before the bleeding stopped.

The forty-seven specimens examined were divided into three groups: (1) blood from babies deep in asphyxia; (2) from babies who gasped once or twice during the collection of the blood; (3) from babies who were born crying. In group (2) it was frequently impossible to determine whether or not air was being drawn into the lungs, but it may be inferred that some babies succeeded in partially aerating the lungs as the carbon dioxide content in this group was found to be between the

two. The occasional wide variations within the groups are undoubtedly due to faulty technic in collecting the specimens.

| GROUP 1 ASPHYXIATED | | GROUP 2 GASPING | | GROUP 3 CRYING | |
|------------------------|-------|--------------------|-------|-------------------|-------|
| 1. | 53.0 | 1. | 51.0 | 1. | 34.4 |
| 2. | 59.0 | 2. | 51.9 | 2. | 40.0 |
| 3. | 40.4 | 3. | 47.0 | 3. | 46.2 |
| 4. | 59.8 | 4. | 51.0 | 4. | 42.0 |
| 5. | 66.4 | 5. | 41.4 | 5. | 34.7 |
| 6. | 63.0 | 6. | 43.4 | 6. | 48.5 |
| 7. | 40.5 | 7. | 42.4 | 7. | 42.4 |
| | | 8. | 51.0 | 8. | 49.0 |
| Average | 54.6% | 9. | 42.4 | 9. | 53.0 |
| | | 10. | 48.7 | 10. | 54.0 |
| | | 11. | 49.0 | 11. | 57.0 |
| | | 12. | 50.0 | 12. | 41.0 |
| | | 13. | 48.0 | 13. | 54.0 |
| | | 14. | 46.2 | 14. | 32.4 |
| | | 15. | 43.3 | | |
| | | 16. | 43.3 | Average | 44.9% |
| | | 17. | 43.8 | | |
| | | 18. | 43.3 | | |
| | | 19. | 48.0 | | |
| | | 20. | 50.4 | | |
| | | 21. | 39.0 | | |
| | | 22. | 52.8 | | |
| | | 23. | 46.0 | | |
| | | 24. | 56.7 | | |
| | | 25. | 46.2 | | |
| | | 26. | 55.7 | | |
| | | Average | 47.3% | | |

From this small number of cases it would seem that the carbon dioxide content of the blood in the newborn is consistently high; that the proportion of carbon dioxide increases with the degree of asphyxia; and, therefore, that the addition of carbon dioxide to oxygen as a re-suscitating agent is contraindicated.

REFERENCE

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1835 I STREET NORTHWEST.

REPORT OF TWO CASES OF URETERAL CALCULUS IN THE FEMALE*

By DOUGAL BISSELL, M.D., F.A.C.S., New York, N. Y.

CASE 1.—*Perforation of the Ureter by a Calculus Complicating Pregnancy.*—The patient whose history now follows entered the Woman's Hospital on July 21, 1916, aged thirty-six. She was thirty-three weeks pregnant and was delivered normally on July 22, 1916. Eight days before delivery, while completing her bath, with one foot on the edge of the tub and the other on the floor, she lost her balance and, in an effort to regain it, twisted her body. No immediate ill effects were noted but, about ten minutes later, when she retired to an adjoining room, she was seized with an agonizing pain in the right pelvic region. The pain lasted two minutes or more, then gradually subsided, followed by vomiting. On the following day she again vomited. No urinary symptoms were noted.

After delivery a large mass was seen, extending from the lower border of the right floating rib to the pelvis. On July 23 the mass seemed boggy and larger. On July 28 it was considerably larger, and fluctuation was noted. On August 1 a cystoscopic examination showed the left ureteral orifice to be normal, with normal flow; the right not functioning. Length of left ureter was normal. The right was obstructed at 15 cm. The catheter in the right ureter showed, by x-ray photograph, the point of obstruction and showed, also, that the ureter was pushed away well to the left and that there was a shadow, which suggested a calculus, in the region of the kidney. The comments of the urologist were: rupture of the right ureter, injury to the right kidney, and blood clot obstructing ureter or an impacted calculus in ureter.

August 6 the mass greatly increased in size, occupying nearly one-third of the abdominal cavity. It was globular in its upper portion, with distinct fluctuation. On this date the patient was transferred to the Gynecological Department in my care. August 7 I made a right lumbar incision and exposed a large, cystic mass from which more than three quarts of turbid urine were aspirated. The opening was then enlarged and the lumbar region explored but, as the course of the ureter had been greatly distorted by pressure, it was impossible to find it and also impossible to determine the point of leakage. A rubber drainage tube was anchored in the fatty space. On August 14 a cystoscopic examination was again made. The mucous membrane of the bladder was more engorged than previously. The catheter passed in the right ureter was obstructed at the pelvic brim. An x-ray shadow in the right kidney region suggested a calculus. Urine continued to pass freely through the drainage tube until August 28, when an olive-shaped stone, pointed at one end, with its long diameter measuring 1 cm. and its short diameter $\frac{1}{2}$ cm. was voided. After this stone was passed, drainage through the tube diminished. On further x-ray examination, no shadow was seen in the kidney or ureteral region. The tube was withdrawn on September 22 and the wound soon healed.

Comments.—It would seem self-evident that some mechanical disturbance occurred on or about the time at which the patient lost her balance over the bathtub. The initial injury to the ureter probably occurred at the moment of severe pain in the right side and ten minutes after the bathtub incident. Reflex gastric

*Presented by title at the Fifty-fifth Annual Meeting of the American Gynecological Society, May 19-21, 1930.

symptoms occurred at that moment, but no vesical symptoms were noted during the eight days preceding her delivery. Immediately after delivery there was noted, for the first time, a large mass, extending from the lower border of the ribs to the pelvis, which eventually proved to be a collection of urine in the tissues of the lumbar region. Catheterization of the right ureter showed, on several occasions, obstruction of the ureter. The urine ceased to flow from the drainage tube soon after an olive-shaped stone was passed.

The escape of the urine into the cellular structure of the lumbar region was evidently the result of a puncture through the upper ureter. The illustration

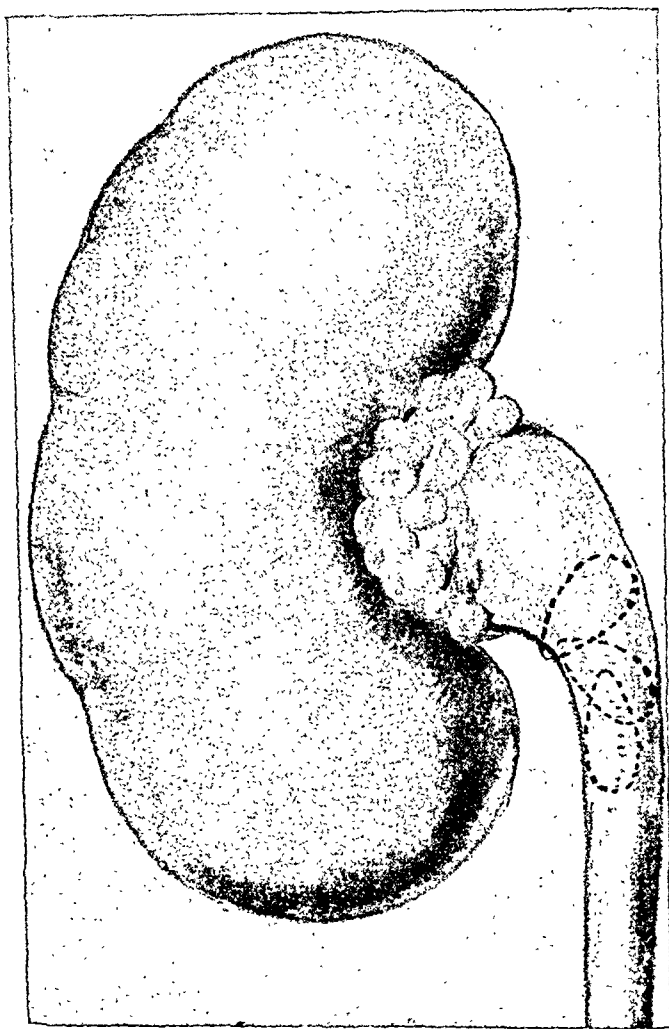


Fig. 1.—Showing point of injury in ureter and positions of stone in its descent.

(Fig. 1) shows the probable manner in which this took place. As the olive-shaped stone began its descent, its lower or pointed end was caught in the mucosa of the ureter. The long axis of the stone then rested across the ureteral passage at an angle. The sudden muscle strain, at the time when patient lost her balance over the bathtub, forced the rounded end down and to a closer contact with its apposing ureteral wall. The persistent pressure of the sharp point occasioned pain and resulted in the partial penetration of the ureteral wall. It is probable that perforation of the wall and escape of urine into the tissue of the lumbar region did not occur until labor set in. When the puncture occurred, the long diameter of the

stone became relatively shortened, permitting the rounded end to assume a lower position, in which way the stone was more nearly adapted to the caliber of the ureter. During delivery the intraabdominal pressure was sufficient to drive the rounded end still further down and, as the stone continued its descent, the pointed end became dislodged from the opening and eventually the stone found its way into the bladder.

OTHER CASES FOUND IN LITERATURE OF PERFORATION OF THE URETER BY A CALCULUS

I have been unable to find, in the literature pertaining to injuries of the ureter, a case similar to the one above reported. In fact, I have found reported, during the past twenty years, only two cases of perforation of the ureter by a stone.

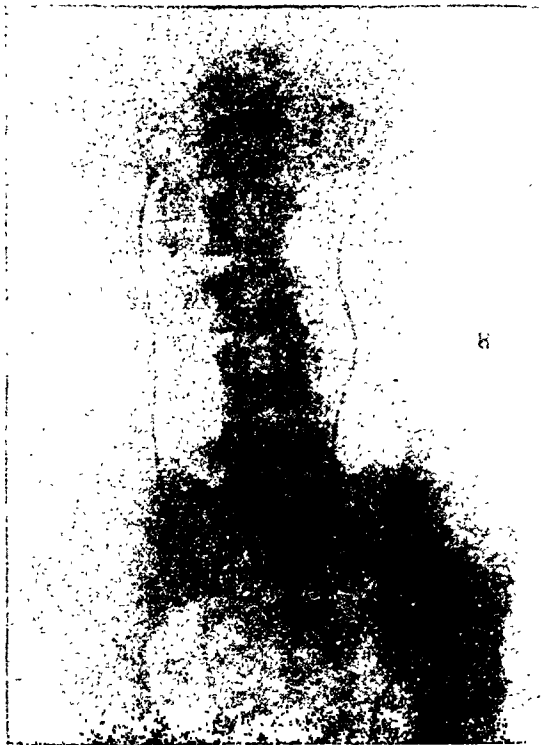


Fig. 2.—(Case 2.) Showing position of stone previous to nephrectomy.

Both of these were in the male. One was reported by Charles S. Stern,¹ in 1910, where the stone perforated the intramural portion of the left ureter, and eventually escaped into the bladder. No operation was required.

The second case was reported by James Berry,² in 1920. In this case swelling was noted in the lower abdomen on the right side, with pain and urinary symptoms. The abdomen was opened in this immediate region, and the swelling was found to be retroperitoneal. An incision was then made into the swelling and a calculus removed. The calculus was shaped very much like that found in the case which is the subject of this article; i.e., an olive-shaped stone with a sharp point. It was much larger, however, and more irregular at the opposite point. The right ureter was examined and an opening found in it, one-half inch in length, through which the calculus escaped. Drainage of the peritoneal cavity and of the ureteral area was established, but the patient died, of uremia sepsis, on the twenty-fourth day after operation. The autopsy on this case was of interest, not only in determining

the cause of death, but because, in the left ureter, well down in its pelvic portion, there was found a very large olive-shaped stone, three or four times larger than that which penetrated the ureter on the right side.

CASE 2.—*Ureteropyolithiasis*. The second report is of a patient, aged forty-five, who came under my care at the Woman's Hospital, January, 1926. The records show that five years previously she had entered the hospital on another service, with a diagnosis of pyelitis of the left kidney and abscess of the right Bartholin gland. Her chief symptoms were a constant desire to urinate, bloody urine, lowered vitality, and exhaustion. Urine culture showed colon bacilli and staphylococci. Temperature was 103° F.; hemoglobin 36 per cent; red corpuscles 1,952,000. X-ray with catheter in ureter showed a well-marked shadow in contact with the catheter at the left ureteropelvic juncture. There was no shadow in

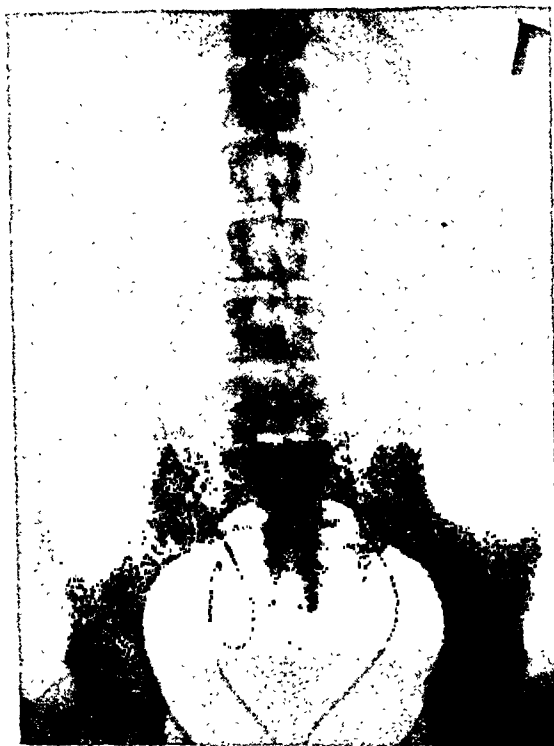


Fig. 3.—(Case 2.) Showing catheter coiled around stone which descended into the sacculated portion of the ureter. Five years after nephrectomy.

the kidney region. Treatment included excision of the right Bartholin gland and lavage of left kidney. On discharge, five weeks later, her first two symptoms were relieved and the red corpuscles rose to 3,280,000; hemoglobin was 58 per cent.

Five months later she reentered the hospital on the same service. Her chief complaints were cloudy urine and a feeling of exhaustion, although she had gained twenty pounds during the five months' interval and weighed 105 pounds. X-ray examination of the ureteral tract was again made. The left kidney was found greatly dilated and its structure extensively involved. It was then removed, with part of the upper ureteral tract. A free stone, the size of a cherry, was found in the lower pole of the kidney.

During the five years' interval between her first admission to the hospital and the time when she came under my direct care in January, 1926, she became what might well be considered a gynecologic case. The ureteral stone, which in the first x-ray study was found at the ureteropelvic junction, was at this time found at

the juncture of the ureter and bladder, and a catheter in the left ureter could be passed only 15 cm. and in the right 31 cm. Normal urine flowed from the right side, but, from the left there was a stream of pus (gram-negative colon bacilli). The x-ray picture of the left ureter showed the catheter coiled around the stone in the lower portion of the ureter. Stereoroentgenograph, with catheters in position, showed a distinct dilatation of the lower portion of the ureter. The left ureter was injected with 8 c.c. of a 12 per cent solution of sodium iodide which gave a picture of a greatly distended ureter.

Vaginal examination showed a mass of considerable size on the left side and, on the right, an adnexal mass of lesser size. Operation January 14, 1926: A median, abdominal incision was made below the navel. On opening the pelvic cavity, the adnexae were found firmly agglutinated to the base and under-surface of the left broad ligament. The tube was greatly thickened and the ovary very



Fig. 4.—(Case 2.) Removed pelvic portion of ureter. Stone is seen in sacculated area laid open.

much enlarged and cystic. These were freed and removed. The right adnexa was also adherent. The tube, a hydrosalpinx, was removed and the adherent ovary freed. At the base of the left broad ligament the greatly thickened and distended ureter could be easily traced from the cervical area to above the iliopectineal line. The posterior surface of the left broad ligament was incised, and the tissue surrounding the diseased ureter was freed upward toward the infundibulopelvic ligament. The freeing of the ureter was continued to within a short distance of the iliopectineal line, where a window was made in the mesentery of the sigmoid, and the engorged vesicles of the mesentery were thereby not injured. Through this window the separation of the ureter was continued upward. Another window was made still higher and, through it, the freeing of the ureter from its surrounding tissues, up to the crest of the ilium, was completed. The upper portion of the ureter, being then freed, was pulled down out of its bed and brought into the pelvis. The mesenteric windows were then closed.

In freeing the ureter, the real difficulty encountered was in the broad ligament and bladder regions. Here it had to be cut away with scissors, as the surrounding tissue was very dense and the ureter firmly attached to it. A small opening was accidentally made through the ureteral wall and pus escaped, soiling the field of observation. The ureter was tied off at its base in close proximity to the bladder, chromic gut being used. Because of the soiling of the pelvis, and because of the degenerated condition of the ureteral tissue, it was deemed wise to drain the pelvic cavity. Two cigarette drains were placed at the base of the broad ligament, emerging through the lower angle of the abdominal wound. A self-retaining Sims catheter was placed in the bladder but, on the sixth day, the abdominal dressings were found saturated with urine. The bladder was irrigated for twenty days. Drain was removed on the tenth day. Abdominal wound closed on twentieth day after operation.

The advantage of the median abdominal approach would seem apparent in this instance, because of the mixed pathology and the low area of ureteral involvement. Had the ureter been approached retroperitoneally, the difficulty in freeing it at the base of the broad ligament would have been much greater and the freeing accomplished with less exactness. Also, had success been met with, the gynecologic pathology would have complicated matters very much and would, from necessity, have been left to be dealt with at another time.

The patient made an uninterrupted recovery and has remained in good health.

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219 WEST SEVENTY-NINTH STREET.

Fischer, W.: Gangrene of the Forearm in the Newborn. Arch. f. Gynäk. 136: 180, 1929.

The author reports a case of gangrene of the forearm in a newborn infant which proved fatal on the fourteenth day. Autopsy showed an extensive thrombosis involving the right radial, ulnar, brachial and axillary arteries and veins with extensive embolism of the left pulmonary artery, left lung infarction, portal vein thrombosis and both cutaneous and gastric hemorrhages. The author believes that trauma at birth, of both arteries and veins, leads to an ascending thrombosis of the brachial and axillary veins and finally to a thrombosis of the pulmonary artery.

RALPH A. REIS.

REPORT OF A CASE OF FETAL GENERALIZED EDEMA

BY JOHN JOSEPH GILL, M.D., F.A.C.S., AND IRVING AULD, M.D.
CHICAGO, ILL.

(From the Wesley Memorial Hospital)

EDEMA of the fetus is a rare condition, not a pathologic entity, but a group of structural morbid changes characterized by general anasarca, by the presence of fluid effusions, and usually by edema of the placenta and results in death of the fetus before, during, or soon after birth.

Clinical histories show the mothers to be seldom under thirty years of age, usually well advanced in child-bearing life and having had a number of pregnancies.

This case which we are reporting conforms to all of these enumerated characteristic conditions. Furthermore, it definitely demonstrates a positive method of antenatal diagnosis not previously mentioned in the literature.

Mrs. H. J., born March 13, 1898, of white German-American parents, married August 2, 1920. The husband, thirty-four years of age, is in good health. No previous illness, accident, or operation. Family and personal history have no bearing on this case. Syphilis, cancer, tuberculosis, and nephritis are excluded. Her menstrual periods began when she was thirteen years old and when she was not pregnant, have been regular, painless, thirty-day type and lasting five days.

Her pregnancies have been as follows:

First, October 7, 1922, full term, long labor, a forceps delivery, girl, stillbirth.

Second, November 27, 1923, full term, normal labor, girl, living and well.

Third, August 16, 1925, full term, normal labor, girl, living and well.

Fourth, November 13, 1927, full term, normal labor, girl, Mongolian-type idiot, living.

Fifth, June 16, 1929, seven and one-half months, breech extraction, male, still-born, general edema.

HISTORY OF PRESENT PREGNANCY

Last menstruation November 4, 1928. The pregnancy progressed in a normal way. No nausea. Some depression for first six weeks. Felt life March 20, 1929. Except as compared with her previous experiences, the uterus seemed more distended than usual for the same period of gestation and fetal movements were sluggish but more painful. Slight edema of ankles during latter three months of pregnancy.

Labor began June 16, 1929, at 9 A.M. Examination revealed a baby of unusual size for the calculated seven and one-half months. The breech presented, small parts were easily palpated and were less supple than normal. The body was unusually rigid and distended. A röntgenogram (Fig. 1) showed a baby of apparent full-term size, with flaring ribs and distended arms which upon delivery was explained by the edematous condition of the fetal body.

The bag of waters, with no increased fluid, ruptured at 4:15 P.M., and a foot appeared at the vulva. At 4:32 P.M. a dead six pounds and 13 ounces male child was delivered without difficulty except for the extra traction required to draw out the enormous abdomen. Eight minutes later the three-pound edematous placenta was expelled. The uterus contracted firmly and the mother's puerperium was uneventful.



Fig. 1.

On June 18 the infant corpse was examined by Dr. Stuart L. Vaughan, pathologist at Wesley Memorial Hospital.

Weight 3057 gm., high-grade general anasarca present, tissues pit on pressure, eyes swollen shut, ears cauliflower shape, marked edema of the penis, enormously distended abdomen.

The main incision divides a thick panniculus from which fluid drains; the abdominal cavity yields 650 c.c. of clear amber fluid; the pleura is smooth, and pleural cavities contain only a small amount of fluid; all internal organs show marked anemia and edema; tongue and pharynx are normal; marked edema of glottis; moderate amount of clear fluid in trachea and bronchi; thyroid not remarkable; thymus is small, weighs 4 gm.; well separated lobules; the medulla, with many Hassell's corpuscles, poorly differentiated from cortex; lungs reddish, pale, entirely atelectatic, do not crepitate, blood vessels congested, cut surface, grayish-yellow and red.

Pericardial sac contains normal amount of fluid. Heart normal size, muscle pale, walls normal thickness, cavities normal size, foramen ovale widely patent and shows a valve-like membrane. The ductus arteriosus is widely patent and, although of the same caliber as the pulmonary artery, has a different appearance, as its lining is bluish in color and wrinkled.

The liver weighs 140 gm., microscopically congested and an enormous number of hematopoietic foci, conglomerate in places.

Spleen several times normal size, weighs 25 gm., pulp richly cellular, follicles poorly developed.

Adrenals and kidneys show marked pallor and a high grade of putrefaction, microscopically, congestion and edema. Glomeruli appear underdeveloped. Gastro-intestinal tract not abnormal.

PATHOLOGIC DIAGNOSIS

(1) Abnormally patent ductus arteriosus. (2) General anasarca and congestion of organs. (3) Fetal atelectasis. (4) Hypoplasia of thymus. (5) Hypertrophy of spleen with hypoplasia of follicles. (6) Hematopoiesis of liver. (7) Kidney underdeveloped. (8) Placenta, large, pale, edematous, weight 1361 gm.

2449 SOUTH DEARBORN STREET.

Society Transactions

AMERICAN GYNECOLOGICAL SOCIETY

FIFTY-FIFTH ANNUAL MEETING

Hot Springs, Virginia

MAY 19 TO 21, 1930

(Continued from November issue)

12. **The Method of Delivery and End-Results of Two Hundred Twelve Cases of Occiput Posterior Position**, by Dr. Norris W. Vaux, Philadelphia, Pa. (For original article see page 782.)

DISCUSSION

DR. BENJAMIN P. WATSON, NEW YORK, N. Y.—Given a normal pelvis, a normal head, and a normal-sized child, the L.O.P. or R.O.P. position is the complication most likely met with. The figures presented were extremely interesting, especially those relating to the results following version. At the same time, I cannot quite bring myself to the idea that version should be a routine procedure in the treatment of occipitoposterior cases. After all, over 50 per cent of Dr. Vaux's cases terminated normally and were delivered without any interference whatever. I think if it were advocated that version should be a routine procedure, when an occipitoposterior position was diagnosed, the results all over the country would not be as good as they are at the present time.

I should like more particularly to draw attention to a method of treatment which has received very little attention in this country: namely, the possibility of changing the occipitoposterior position to an occipitoanterior one in the latter part of pregnancy. This is a method to which attention was first called in Britain by Buist of Dundee, who gave figures relating to it. Hamilton in Edinburgh also published a series of cases in which he showed that he could change the position in a large percentage of the cases. I have always adopted this method in private practice and have found it to work extremely well. If you find that the position is an occipitoposterior one, say two weeks before the patient is due, it is usually a very easy matter to convert it into an occipitoanterior position simply by placing a folded hand towel between the anterior superior spine of the mother and the anterior shoulder of the child, and holding it there with a binder or some adhesive plaster. Leave it on for twenty-four hours, and you will find in the majority of cases that the shoulder has been forced around and the head has become engaged in an occipitoanterior position. I have done that in all of my private cases and have never known it to fail in the last four years. We are at present working it out in a greater number of cases in the clinic and in the course of a year we shall have some figures to present. We try to do cephalic version when we discover a breech presentation and we succeed in a certain number of cases, but in a very much larger number of cases we can succeed in converting an occipitoposterior position into an occipitoanterior one in the way I have described.

DR. EDMUND B. PIPER, PHILADELPHIA, PA.—I do not believe that Dr. Vaux intended to advocate version for occipitoposterior position except in the cases where

it is particularly indicated. I took my figures from the Lying-In Service at the hospital to see how closely they related to Dr. Vaux's figures. In a period from June, 1927, to January, 1930, there were 1151 deliveries and 184 occipitoposterior presentations, or 15.9 per cent. Cephalic presentations were 1108; breech presentations, 37; transverse, 6. The positions in cephalic presentations were: L.O.A. 51.9 per cent; L.O.P. 9.2 per cent; R.O.A. 31.3 per cent; R.O.P. 7.4 per cent; face 0.1 per cent. The method of delivery in 173 cases of posterior occiput was: podalic version 54; forceps, mid and low, 35; spontaneous, 84. Morbidity of the mother in reference to the method of delivery showed version morbidity, 42.6 per cent; forceps morbidity, 34.2 per cent; spontaneous, 32.1 per cent. There was no maternal mortality.

The fetal mortality in posterior occiput cases was uncorrected; all cases over four and one-half months. The total fetal mortality, including stillbirths, was 4.04 per cent; stillbirths, 6, or 3.44 per cent; neonatal deaths, 1, or 0.6 per cent.

Tabulation of fetal mortality cases:

1. Version, full term, macerated, stillborn fetus (Wassermann negative).
2. Version, full term. Emergency version because of placenta previa. Multipara, child stillborn, dying of fracture of vertebra and tear of tenorium.
3. Version. Primipara, maternal heart disease. Child stillborn. Autopsy, intracranial hemorrhage.
4. Forceps, Scanzoni maneuver. Patient in labor long time after rupture of membranes. Bandl's contraction ring present. Intrapartum death of child due to intracranial hemorrhage.
5. Spontaneous delivery. Stillbirth, full term, macerated fetus.
6. Spontaneous delivery. Premature separation of placenta. Stillborn, premature (seven months) child.
7. Spontaneous delivery. Child died on third day of prematurity and congenital syphilis.

Fetal mortality in reference to type of delivery:

| | |
|-------------------------------|--------------|
| Version (fetal mortality) | 5.5 per cent |
| Forceps (fetal mortality) | 2.8 per cent |
| Spontaneous (fetal mortality) | 3.5 per cent |

Birth injury (nonfatal) in reference to type of delivery:

| | |
|--|-------------------|
| Version | 0 |
| Forceps | 2 or 5.6 per cent |
| (Both proved to be cases of intracranial hemorrhage) | |
| Spontaneous | 0 |

The uncorrected mortality was 3.8 per cent; the corrected mortality is 1.1 per cent.

Birth injuries that were nonfatal included two proved cases of intracranial hemorrhage and they recovered.

DR. HERBERT M. LITTLE, MONTREAL, CANADA.—The discussion has proved that it is best to do something with these cases before they have gone too far. If the position can be changed, the results are satisfactory; and the cases that go wrong do so because they are left to become impacted. It does not make much difference what one does so long as he does the thing he is qualified to do.

In my experience in the last ten years with 123 R.O.P. cases, one woman with influenza died and her baby died. That was the only fatality among the mothers, and only four additional babies died. Of these, two were high forceps deliveries, one after laboring for four days and the other after sixty hours. One baby delivered with low forceps died of intracranial hemorrhage, and a fourth left too long, developed an extensive cephalhematoma, the hematoma became infected and the baby died.

Normal labors were about in the same proportion as in Dr. Vaux's cases (there were 56 out of the 123), and there were only six versions. All the rest were forceps deliveries, forty of which were done at the completion of the first stage when the head was mobile. The forceps were applied to the sides of the head and with traction, rotation took place. This is not the Scanzoni method.

For fifteen years we have taught that the proper time to deliver these patients is when the cervix is fully dilated and the head is still movable, then one can go ahead with certainty. Apply the forceps and make traction, and in 90 per cent of the cases the head will rotate forward. After this rotation, the forceps is removed and reapplied for extraction. Should rotation result in a directly posterior position of the occiput, extraction "O.P." follows as a matter of course. I think our statistics prove that this is a fair way to handle these cases. If the head shows no signs of advance once the cervix is dilated and the membranes ruptured, and the obstetrician believes he can do a version better than a forceps operation, let him do it by all means, but the double application of the forceps is the simpler, and for me, the better way to deliver.

DR. WILLIAM E. CALDWELL, New York, N. Y.—In one of Dr. Ballantine's publications he states that the majority of our difficult obstetric operations are brilliant recoveries from positions that might have been prevented. I am glad that Dr. Vaux has called attention to the large number of cases with occipitoposterior positions that come to labor and frequently proceed to a prolonged labor undiagnosed.

Dr. W. E. Studdiford in a review of breech presentations for the White House Conference is also finding that a great number of such presentations are not diagnosed until labor. A very large proportion of the cases that we see in consultation on account of dystocia are due to unrecognized occipitoposterior positions with extended head. The majority of failed forceps cases are due to unrecognized occipitoposterior positions or to an attempt to rotate the child's head in the small diameters of the pelvis or through undilated cervixes.

We all agree that we should perfect ourselves in external palpation and teach it to our students and that it is the most important method of examination before labor and in the early part of the first stage, before the membranes are ruptured. Occasional rectal examinations combined with careful external palpation will give all the information that is necessary to the proper handling of a case in the vast majority of labors. The correction of the torsion of the uterus, the application of pressure to the anterior shoulder as advocated by Dr. Watson, the use of binders and posture to fit the child's head into the brim before the woman has become exhausted will greatly reduce the incidence of undilated cervixes and difficult operations.

There is a tendency to brag about the number of labors conducted without vaginal examinations. I believe the danger of properly conducted vaginal examinations has been greatly exaggerated.

A. B. Davis did not find an increased morbidity in the 80,000 deliveries in the New York Lying-In Hospital where very frequent vaginal examinations are made. The midwives in England and in the Scandinavian countries reporting a very low morbidity are allowed to make vaginal examinations.

Bailey does not show a decreased morbidity in the Bellevue Service in spite of limiting both vaginal and rectal examinations to the minimum. The very large number of cases reported of women dying from sepsis where no vaginal and no rectal examinations were made, as well as the recent bacteriologic examinations made during labor and at the end of the third stage, must convince us that the majority of such infections occur at the time of delivery and especially in the third stage of labor or immediately afterward. I think we should urge more care-

ful combined external and vaginal examinations in delayed labor, or in labor that has ceased to advance, and long before the woman becomes exhausted, when there is some chance of saving her from difficult operations which become necessary in neglected cases.

Dr. Virgil Damon at Sloane has reviewed 475 cases of occipitoposterior positions in slightly over 10,000 labors where the head failed to rotate and when the rotation and delivery were assisted. Among these 475 cases, 22 delivered spontaneously as occipitoposterior. These were mostly in multipara and usually were very small babies; 292 of the 475 cases occurred in primipara and 183 in multipara. Among the multipara, the previous labors showed 38 forceps, 5 versions and 4 breech extractions with 10 stillbirths. One hundred and forty-eight or 30 per cent of the 475 cases showed contracted pelves as follows: Male, 55 or 38 per cent of abnormals; generally contracted, 39; simple flat, 40; rachitic, 4; oblique contracted, 3; normal pelves, 327.

The average labor for all cases was nineteen and one-half hours, the maximum eighty-six hours, and the minimum two hours. The delivery of these cases showed manual rotation in the hollow of the sacrum followed by normal delivery in 131 cases, manual rotation in the hollow of the sacrum followed by low forceps in 90 cases, and rotation in the hollow of the sacrum by the use of one or both blades and then followed by forceps extraction in 214 cases. Fourteen versions and four cesarean sections were done; 60 per cent of these cases showed lacerations; 95 first degree, 97 second degree, 9 third degree, and episiotomies in 83. Lacerations of the cervix were noted in 12 cases. Only 59 cases, or 12 per cent of the 475, had early rupture of the membranes. In 12 cases there was a severe postpartum hemorrhage. There were 3 maternal deaths among the 475 cases; 1 from embolus, 1 in a woman with a serious cardiac lesion and 1 in a toxemia of pregnancy with premature separation of the placenta. There were 11 stillbirths and 5 cases that showed slight, temporary birth injuries. In 16 cases, the baby though delivered alive died within a month; 4 from prematurity, 4 from bronchial pneumonia after prolonged labors, 4 not autopsied, 2 from cranial injury, making an infant death rate of a little over 5.68 per cent.

I believe that occipitoposterior position with extended head accounts for a very large proportion of cases of dystocia both in the first and second stage, that the majority of the neglected cases are due to this complication and failure to make an early diagnosis and institute the proper treatment. The important procedures are to fit the head into the brim and to maintain flexion. A child's head should never be rotated in the small diameters of the pelvis and can usually be rotated easily in the planes of the greatest diameter. I would urge vaginal examinations carefully done even under an anesthetic when labor is not progressing satisfactorily.

I agree with Dr. Vaux that version is frequently indicated in the conditions which he has mentioned and that it is the easiest way of delivering many cases of dystocia due to occipital posterior position.

DR. COLLIN FOULKROD, PHILADELPHIA, PA.—At least 50 per cent of the occipitoposterior positions that I see have premature ruptures of the membranes before they go into labor. Dr. Vaux reports scarcely 5 per cent of premature rupture. If a woman comes to me with premature rupture of the membranes my procedure is entirely different from the one I would use for the patient with a perfectly normal onset of labor, with membranes intact.

It seems to me that the management of the labor from the very beginning is the most important part of the treatment. If I remember correctly, at least 50 per cent of Dr. Vaux's cases had contracted pelves. This class of patients with unruptured membranes presenting for delivery does not offer a good field for version. I think, in dealing with an occipitoposterior, with unruptured membranes,

and with a contracted pelvis, there should be some consideration given to cesarean section before we consider version. Version has a place in occipitoposterior position which has been definitely settled and allocated for a number of years. In patients who after a long first stage of labor have been unable to engage the head or if engaged it is not in midpelvis, and is not then easily delivered by forceps, we must consider delivery either by high forceps or version, the decision depending on the individual's ability to do one or the other.

DR. ROBERT L. DICKINSON, NEW YORK, N. Y.—In the Brooklyn Hospital an effort has been made for the last twenty years to try to limit the use of forceps rotation in occipitoposterior positions because younger and unskilled operators do considerable damage to the child and often to the mother. The method spoken of by Dr. Watson, attempting to correct the position before labor, is very good. I developed and taught a method of rotating through seizure of the anterior ear by two fingers in the vagina, correcting the position by pressing on the shoulders (*American Medicine*, Sept. 7, 1901.) We have used this method and the Pomeroy method with good results for many years. He freed the head, shoved it back over the brim of the pelvis, under anesthesia, doing an overcorrection of 180 degrees and then holding until the head locked down into the pelvis. It is suited to cases on which version is feasible.

DR. JOSEPH L. BAER, CHICAGO, ILL.—I should like to ask Dr. Vaux whether these versions are undertaken when labor has definitely ceased to progress or whether they are elective in spite of normal progression of labor? If it is an interference in the normal progress of labor I confess that I do not feel free to subscribe to that procedure.

The preservation of membranes in so overwhelming a percentage is quite out of the ordinary.

The procedure that I favor is noninterference in occipitoposterior position in the presence of normal progress of labor with no disproportion. Only if the head comes to a complete standstill at any level in the pelvis do I feel justified in interfering, and then only in the presence of complete dilatation.

Relative to the importance and harmlessness of vaginal examinations carefully done, my associate, Dr. Ralph Reis, made a study of 609 patients examined vaginally, 271 examined rectally, and 106 not examined. The morbidity curves were practically parallel in the three series.

DR. VAUX (closing).—Dr. Watson in correcting the posterior position before the onset of labor, has given us an admirable suggestion. As I showed in my paper, we have attempted to correct the position of the child in only four instances before the onset of labor.

I think Dr. Piper's remarks carry out more fully the points that the others have made. We do not elect to interfere in the labor in the posterior position cases until the labor has ceased to progress for two hours. At the end of that time when the cervix is fully dilated and the membranes are unruptured we elect then to do a version in preference to a forceps application and a rotation of the head in the midpelvis. We are opposed to any maneuver in the small diameters of the pelvis. Preferably in the forceps cases we pull the head down and rotate it in the lower, and wider diameter of the pelvis, and I feel that it is a great mistake to attempt to rotate the head by forceps at any station in the pelvis other than at the pelvic floor. If you wish to rotate the head manually that is another thing; if the head is in the small diameter it is best accomplished by pushing it back and rotating it, but to rotate it by forceps in the midpelvis or where the diameter is the smallest in the pelvic girdle, one is bound to encounter difficulties and to get bad results for the child and in many instances bad results for

the mother. I attempted to show in the paper that the percentage of lacerations of the pelvic structures by forceps is greater than the lacerations which were the results by version.

The question that Dr. Little brought up is one that I have stressed in my paper, that is in letting cases go too long in labor in the posterior position. We elect to do the version to get away from that very thing where the specific indications are present; where labor has ceased to progress for two hours, instead of letting them go on, we elected to do the version in thirty cases over the 133 delivered spontaneously and the 53 delivered by forceps, and I think we had better results in so doing.

13. Vaginal Hysterectomy Under Local Anesthesia, by Dr. George Gellhorn, St. Louis, Mo. (Published in *Surgery, Gynecology and Obstetrics*, October, 1930.)

DISCUSSION

DR. ROBERT L. DICKINSON, NEW YORK, N. Y.—Dr. Gellhorn has kindly referred to the series of vaginal hysterectomies done by two suture ligatures, presented at the International Congress of Medicine, London, 1913. (*Jour. of Obst. and Gynec.*, British Empire, Sept., 1913.) A curious fact to a man who has been forty-five years or so at this work, is that the former skill of gynecology is apparently lost. I have harped endlessly on the fact that we have had to perfect our methods before we dared open the battle on the general surgeon. Many of the tricks that we learned were afterward neglected. Now we may as well hand over gynecology to the general surgeon as he summons us to do unless we have some methods of office expertness and some operations which the surgeons have not. The speculum of Sims is now little used in the hospital of Sims. In the same way many of the old aids to diagnosis have become almost lost. I have seen a former Chicago gynecologist with an office in which was a pair of rubber gloves but not much else. That principle applies exactly to the operation now in question. This is truly a specialist's operation. Let us either keep it and other refinements in their proper place and keep doing them or turn hysterectomy and gynecology over to the general surgeon. The younger men are not being trained in vaginal hysterectomy.

Since the Le Fort operation we no longer have to treat the prolapses that can be held up otherwise. The cases of uncontrollable climacteric bleeding and those who formerly required a vaginal hysterectomy operation are largely taken care of by radium and this has made us lose some of the skill that we formerly had.

It is the operation of Goff that was described here, plus some simplifications of mine. One of the things that was not brought out was the carrying of the prolapsed bladder up behind the ligaments. It is now called the Mayo operation except that they put on a number of clamps and then proceed to do the suture.

The lessened shock of vaginal operation, the applicability to older women, the fact that the woman who has to lift burdens is not in good condition to do it when she has a recent laparotomy wound, make the operation of vaginal hysterectomy much more satisfactory in cases adapted to it.

DR. LILIAN K. P. FARRAR, NEW YORK, N. Y.—Dr. Dickinson comes frequently to the hospital founded by Marion Sims but he stops on the first floor. How can he know what operations we are doing on the sixth floor? Vaginal hysterectomy is frequently done at the Woman's Hospital under local anesthesia.

There is one point I would like to make: we fasten the broad ligament anteriorly to the suprapubic fascia to prevent cystocele. We fasten the utero-sacral ligaments posteriorly to prevent enterocele.

DR. GEORGE GRAY WARD, NEW YORK, N. Y.—Replying to Dr. Dickinson's remarks about the Sims speculum not being used at the Woman's Hospital, he is mistaken. He apparently did not happen to see me use it for I frequently do.

DR. JOHN A. MCGLINN, PHILADELPHIA, PA.—There were two points in Dr. Gellhorn's paper worthy of especial attention: first, the ability to operate on very old people under local anesthesia. It renders what might be a dangerous procedure under inhalation anesthesia or spinal anesthesia a comparatively safe operation. It is possible to do abdominal operations or pelvic operations under local anesthesia plus morphine and scopolamine. In a large series of cases we have done a number of vaginal hysterectomies, with equally good results so far as the comfort of the patient is concerned by simply carrying the morphine and scopolamine a step further, by adding to it one-twelfth grain of apomorphine, which relaxes the patient and the operation can proceed for two hours or more if necessary.

In reference to the interposition operation, I reported a case of cancer of the cervix following an interposition operation some time ago and there were a number of cases reported here at that time. Immediately after that paper there was another case of cancer of the cervix reported and since that time I have had a second case develop after an interposition operation. We feel now that if there is any suspicion at all either from the curette scrapings as to their character (we always curette before doing that operation), or if the cervix is badly diseased we resort immediately to a vaginal hysterectomy and then interpose the broad ligaments.

DR. GEORGE GRAY WARD, NEW YORK, N. Y.—It has been mentioned twice that credit for the interposition of the broad ligaments beneath the bladder was due to Dr. Goff. As I understand it, that is not so. The operation which Dr. Goff published was to unite the broad ligaments together, but if you will remember in his operation he sewed the bladder to the *under* side of the united broad ligaments. He did not interpose the broad ligaments underneath the bladder. I have always supposed that it was the Mayos who brought that out. The credit of uniting the ligaments, however, belongs to Dr. Goff.

DR. JOHN A. MCGLINN, PHILADELPHIA, PA.—I had been doing the Goff operation No. 2 and one day in pulling down the united broad ligaments found that the bladder slipped over the posterior side, which antedated what the Mayos did, but I never published it. Dr. Goff said he frequently did that and for that reason I gave him the credit.

PROF. E. H. ZWEIFEL, MUNICH, GERMANY.—I only wish that Dr. Gellhorn might read his paper at one of our Congresses and that Dr. Dickinson might give the same discussion that he has given here. It is certainly a great pity that vaginal hysterectomy is not performed as often as it used to be, and there is of course a reason why so many of the gynecologic operations are now performed by the general surgeon.

For the old patient this operation of vaginal hysterectomy is very important, as well as the giving of local anesthesia for the purpose of avoiding pneumonia.

I should like to ask Dr. Gellhorn if he has also made use of sacral anesthesia and how he has found that it compares with local anesthesia.

DR. N. SPROAT HEANEY, CHICAGO, ILL.—There are two points that deserve special consideration in Dr. Gellhorn's paper: first, the benefit of the vaginal hysterectomy; second, the benefits of local anesthesia.

Until the use of ethylene came in I was a strong advocate of local anesthesia in elderly women, but since the use of ethylene I have done no operations under

local anesthesia. Those of you who are not aware of the effects of ethylene I would refer to the Report of the Committee on Anesthetics in the *Journal of the American Medical Association*. The index of the Presbyterian Hospital in Chicago does not keep account of the work according to operations but according to disease, so in March of 1922 I began to keep my own index and since that time, which practically coincides with the use of ethylene, I have collected all cases in which I have done vaginal hysterectomy and I have compiled 327. I had three deaths in these 327 cases. The first case was a woman with fibroids and menorrhagia. She died from peritonitis and I suspect from the history taken afterward an attempted abortion was made on this woman because the uterus itself had an acute endometritis. The second case was a patient who had previously been operated upon and at the conclusion of the operation I injured the gut and sewed it up by the vaginal route very satisfactorily. Subsequently she had an obstruction of the gut. I delayed reopening her and found that it was due to an injured gut from a previous abdominal operation. The suture in the gut had held but the operation was too long delayed and the patient died.

The third case that died was a patient who had an early carcinoma and instead of preliminary treatment with radium and operation subsequently, three months later I operated and gave radium at the same time which was a mistake, and she died on the sixteenth day of peritonitis.

Three deaths in 327 cases of vaginal hysterectomy do not have a great variety of causes. Twelve of these cases were carcinoma of the cervix, extremely early. The patients who were inoperable were treated by radium. None of them were operated upon earlier than three months after the radium administration. Four of these cases were carcinoma of the body of the uterus. One of the cases illustrates particularly well, I think, my chief objection to a local anesthetic in people where a local anesthetic would be indicated, and that is the poor risk. Nineteen of these patients were sixty years of age. Sixty-three were nulliparous women. One case was a woman who had a very serious heart lesion and her doctor wanted her treated with radium. She had carcinoma of the body of the uterus and she was quite obese. She came to the operating room first without any morphine. Patient became excited and wanted to know whether she was not going to be put to sleep; developed an acute condition of the heart and pulmonary edema. She was unconscious for a moment or two and was sent back to her room and treated for a week or ten days by the internist. Then when we felt she was in good condition again we gave her morphine in the room, took her to the operating room, anesthetized her on the table and did a vaginal hysterectomy. Patient made a good convalescence.

The woman who contemplates an operation under a local anesthetic will find plenty of people who will tell her of their experience under a local anesthetic and instill a good deal of fear into her mind.

The patient above referred to returned after three months and I found a sponge in the wall of the vagina and some granulation tissue. I had her put on the operating table and tried to persuade her that under local anesthetic the operation would be over in a few moments and she would not feel any pain. She said she was going to die, she became blue and looked bad and before we could get her feet down she had an acute dilatation of the heart, acute pulmonary edema, and died in the operating room. This patient died three months after she had gotten over the operation with a general anesthetic. That is my objection to local anesthesia; the fear of the patient is the very worst thing for one who is a poor surgical risk. I think this series done under ethylene with no deaths due to anything but surgical complications certainly shows that ethylene as a general anesthetic is fairly safe for doing vaginal hysterectomies.

DR. JOSEPH P. DELEE, CHICAGO, ILL.—I have had quite a little experience with local anesthesia and I am convinced that where local anesthesia is possible it is the best anesthetic that can be used. It has certain limitations. When Sir James Y. Simpson tried to introduce chloroform as an anesthetic he had this experience: He told the surgeons he had a new anesthetic which he wanted to try out. One day they sent for him to administer chloroform to a young man about eighteen years of age who had an incarcerated hernia. As he entered the room the boy died, simply from fear of the operation. Now, if that boy had gotten two or three whiffs of chloroform the history of chloroform might have been different. There is no question that some patients fear an operation but many fear the operation no more than they do the anesthetic. You can get the mind in a proper state by a proper psychologic approach. If a man has an "understanding heart" he can do wonders with local anesthesia. Regarding local anesthesia in general, it stands to reason if you can get along with an anesthetic which will not involve the general system, other things being equal, that will be much better.

We have used ethylene to some extent but are not as enthusiastic about it as Dr. Heaney is. Speaking for the masses, I would say that ethylene is not without danger. Women often vomit during the operation. Postoperative bronchitis is not so frequent but it does occur, and the vomiting often tears the abdominal suture and predisposes to postoperative hernia and rupture of the scar. In introducing local anesthesia in the low cervical cesarean section I had difficulty convincing everybody that it was safe. Especially our cardiologist thought it would increase the blood pressure and predispose to collapse, so we made some blood pressure tests with general and with local anesthesia and found that the mental trepidation was higher in heart cases before the general anesthetic than before the local.

Cervical, low, cesarean section and the classical cesarean section are particularly fitted for local anesthesia, and it should be the anesthetic of choice.

I am particularly against spinal anesthesia. There is a great wave of spinal anesthesia throughout the country. There is a little too much enthusiasm about it and it is bound to result in a high mortality.

In cesarean section local anesthesia is almost 99 per cent successful. There are a few hysterical women whom you cannot control. In arguing with the surgeons regarding local as opposed to spinal anesthesia, I always ask this question: granted that local anesthesia is practical, and there is no doubt that it is, which is safer, to inject novocain into the spinal canal or into the skin?

DR. LILIAN K. P. FARRAR, NEW YORK, N. Y.—May I say a word in favor of spinal anesthesia? We have used it in the Woman's Hospital for probably six or seven years, and we use it for the poor risk patient in preference to any other anesthetic. We use it for what we call the Mayo operation and it has given most satisfactory results. Neocaine is a French import and we give 0.01 or 0.02 milligram injection into the spinal canal. The patient is given a preliminary hypodermic of morphine and scopolamine. We have had no deaths. As to morbidity, there is sometimes a complaint of suboccipital headache. We do find that there may be a fall in blood pressure. We are rather keen on keeping a record of blood pressure, and it is taken not only in the ward but in the anesthetizing room and taken immediately after the operation in the operating room. If the patient's head is lowered she is not likely to have a fall in blood pressure. The patient is brought to her room from the operating room with the legs elevated, pillows under them, and the foot of the bed is also elevated. The patient is kept in that position for three hours. We always have caffein benzoate on hand in the operating room but rarely need it. As soon as the patient is in bed she is given a cup of coffee and is given food at the next meal. There is rarely any vomiting

or discomfort. I have done vaginal hysterectomy on patients seventy-two and seventy-eight years of age under spinal anesthesia with absolute satisfaction. The only discomfort they complain of is keeping their legs in that one position. We also use the neocaine (0.05) in spinal anesthesia for carcinoma patients who need radium. Many of these cases are poor risk patients and do not stand a general anesthetic well. I do not believe a general anesthetic is good for a cancer case anyway. It is up to me to see that they get the anesthetic they need, that they get the radium treatment and that they come out of the hospital alive. I would not want to take care of these patients if I could not use a spinal anesthetic.

DR. GELLHORN (closing).—I fear that local anesthesia for vaginal hysterectomy has not received a wildly enthusiastic welcome from this audience. That is too bad. But then, the procedure is rather new, and neophobia is prevalent in all walks of life. I think that in less than ten years from now what seems revolutionary today, will be a self-evident procedure.

DR. W. P. GRAVES, of Boston, Mass., read a paper, **Some Observations on the Etiology of Dysfunctional Uterine Bleeding.** (See page 500, October issue.)

DISCUSSION

DR. EMIL NOVAK, BALTIMORE, MD.—This subject has many points of contact with other gynecologic problems. Dr. Graves's results, I believe, substantiate those obtained by most others in the study of the histology and pathologic physiology of this type of bleeding.

The term hyperplasia is not altogether a happy one, because the gross picture is not always one of overgrowth. In a certain proportion the endometrium may be enormously overgrown and polypoid, constituting the condition which we used to speak of as polypoid endometritis, but which is not in any way of inflammatory origin. More frequently, however, the endometrium may show little or no overgrowth, and may at times be rather scanty. But in all the gradations the microscopic picture is essentially the same, so that histologic examination rather than the gross appearance of the tissue is the essential for diagnosis.

Up until very recently I had felt that hyperplasia is not found except in association with bleeding, but one or two recent cases have made me question this belief; for instance, the study of the endometrium in a case of amenorrhea of considerable duration showed a typical endometrium. Perhaps if we study more non-bleeding cases we will find this picture more frequently. This fact illustrates the confusion still existing as to the interrelationship of the various hormones which play a part in menstruation. One might think that the nature of the dysfunction in menstrual disorders could be readily solved by biologic-chemical studies; in other words, just as we can determine the amount of urea or sugar in the blood, so we might determine whether there is a deficiency or excess of one or other hormone. From the evidence already available, however, differential diagnosis in these cases will not be so simple. For example, in certain cases of amenorrhea there is an excessive amount of the follicle hormone, perhaps explaining the occurrence of hyperplasia, as in the case I have already mentioned. Nevertheless, I believe it is still true that when hyperplasia of the endometrium is found by microscopic examination the clinical history will almost always indicate bleeding of this so-called functional type.

The whole question of whether, in a given case, the bleeding is actually functional, or whether it is of anatomic origin, is not always easy to settle, even when a definite lesion is present. This is one of the points which I have considered in a

paper to be presented at this year's meeting of the Section on Gynecology and Obstetrics of the American Medical Association.

As Dr. Graves emphasizes, there can be no doubt that the anterior pituitary plays a very fundamental rôle in the reproductive cycle. It is the "motor of the ovary," and disturbances in its function are, unquestionably, often reflected in disturbances of menstruation. There can be little doubt that certain cases of amenorrhea on the one hand, and of excessive bleeding on the other, are of pituitary origin, as are certain cases of sterility; but it will be some time before we can separate these cases out with any degree of precision.

Finally, I should like to emphasize the practical value and convenience of a proper system of nomenclature for these menstrual disorders. The one which I use in my own work I find very convenient: amenorrhea indicates absence of menstruation; hypomenorrhea, a deficient amount of menstrual flow; hypermenorrhea, excessive amount of menstrual flow, or menorrhagia; polymenorrhea, too frequent menstrual periods; oligomenorrhea, too infrequent menstrual periods; dysmenorrhea, painful menstruation. The use of these terms, it seems to me, saves us, in our clinical records, a lot of the clumsy circumlocution which otherwise would be necessary.

DR. GABRIELIANZ, CHICAGO, ILL.—It is very interesting to hear Dr. Graves state that in his eighteen cases the corpus luteum was absent.

Polymenorrhea usually is regarded by many authors as physiologic condition; the menstruation appears once in two weeks at regular intervals and usually profuse. This frequent menstruation is due to frequent ripening and rupturing of the follicles.

On the other hand, oligomenorrhea is menstruation approximately once every six weeks, scanty and due to delayed ripening and rupturing of the follicle.

DR. JOHN O. POLAK, BROOKLYN, N. Y.—We have now 25 cases which we have followed for a period of from ten to fifteen years of their menstrual life; these women have subsequently been hysterectomized and their ovaries removed. The ovaries and the endometrium were studied and we entirely concur in the statement which the doctor has made, that the fibroid itself, except because of its location, has no effect on the menstrual cycle. These cases have been studied most carefully both as to the endometrium at the time of their menstruation and in relation to the state of the ovarian follicles and I think the deduction can be made that only the location of the fibroid has any influence on menstruation.

One other interesting point is that in following a large number of these cases over periods of ten or fifteen years, from adolescence to womanhood, we have noted that many of these girls had severe intrinsic dysmenorrhea and that they belonged to the hyper- or hypopituitary class, and at the time that they were hysterectomized, all these patients had fibroids of small size throughout the uterus which supports the endocrinal theory in the development of fibroids.

DR. ROBERT L. DICKINSON, NEW YORK, N. Y.—A submucous polyp or fibroid does bleed, irrespective of the condition of the mucosa.

DR. N. SPROAT HEANEY, CHICAGO, ILL.—I would like to ask why the name hypoplasia has been changed to dysplasia?

DR. GRAVES (closing).—With regard to the frequency of gland dysplasia, I have found it with such constancy in my study of these cases that I look upon gland dysplasia, dysfunctional bleeding, and arrhythmic ovulation as a three-cornered syndrome, the presence of one factor predicated the presence of the other two.

Gland dysplasia, as I have intimated, occurs in other conditions besides that of uncomplicated idiopathic bleeding. I have already demonstrated its place in fibroid tumors and mentioned that of pelvic inflammation. I had intended to discuss its appearance during the postclimacterium, but omitted it from my paper when I saw that Dr. TeLinde was to read one on a similar subject. The appearances of the endometrium that he described yesterday in connection with the granulosa tumors can also be found with follicle cysts after the menopause, even at an advanced age. There would seem to be some relationship between these two types of tumors, it being possible that they both develop under the influence of the folliculin-like hormone of the anterior pituitary. The subject offers a rich field for research.

In answer to the question about the word "polymenorrhea," in my first series of eighteen dysfunctional cases, I think my nomenclature was misunderstood. It is explained in the abstracts of the cases.

I am glad to hear from Dr. Polak that he agrees with my findings in the study of bleeding fibroid tumors. The fact that the physiology and histology of the ovaries and endometrium in bleeding fibroids is identical with that of functional hemorrhages in the absence of fibroids offers the advantage of always having plenty of fresh material at hand for study. It matters not how large the fibroids may be.

In answer to Dr. Dickinson's query about the relation of polyps to dysfunctional bleeding, I must confess that I have not made a thorough study of this subject. Undoubtedly most of the cervical and some of the endometrial polyps bleed from surface friction. In fact, I often found a normal endometrium with cervical polyps. The endometrial polyps were often associated with gland dysplasia and very likely were themselves a manifestation of the same process. Some of the myomatous polyps were associated with dysplasia and some were not. In this case also the bleeding may be functional or accidental. In this connection I can recall that Dr. Sampson showed many years ago that the bleeding from submucous fibroids usually has its source in that part of the endometrium which does not cover the fibroid.

Dr. Heaney has criticized my coining of a new term, "dysplasia." I have always felt that the words "gland hypertrophy" and "gland hyperplasia" are misleading, and Dr. Novak has himself intimated it. I confess to having been misled by them, since they both suggest an overgrowth in actual size and quantity of the endometrium, which, as Dr. Novak has said, does not always occur. The word "dysplasia" is in the medical dictionary and means abnormality of development, though so far as I know it has never been applied to the endometrium. I selected the term to express more clearly the incoherent nature of the endometrial glands under the mixed influence of the two ovarian hormones. This point is well demonstrated in the photographs which illustrate my paper.

DR. HEANEY.—I thought the Greek prefix *dys* meant obstruction and carried with it the sense of pain.

DR. GRAVES.—I have always thought of the prefix as essentially implying irregularity of function, although I admit you are right in the definition of some words in which it is used.

15. The Question of Possible Endometrial Trauma and Dislocation Associating Uterotubal Insufflation, by Dr. Isidor C. Rubin, New York, N. Y. (See page 519, October issue.)

DISCUSSION

DR. FRANK A. PEMBERTON, BOSTON, MASS.—Dr. Rubin has proved that the cannula does remove particles from the endometrium but it seems practically impossible to dislodge them with the low pressure and slow injection of the gas

such as used in insufflation. If the cannula pushed some endometrium into the ostium of the tube it might blow it in but that is very remote. Gentleness is the chief thing in doing an insufflation. The depth of the uterus and the curve of the uterus should be known and the cannula should be smooth, introduced gently, the gas put in slowly, and the pressure raised slowly.

The cases reported by Moench are certainly a contraindication to insufflation after curettage. I must confess that in three nervous women whom I etherized to do the insufflation, I insufflated first and then made the intrauterine examination to see if they had a submucous fibroid, and I had no difficulty.

From the fourth to the seventh day after the cessation of menstruation, it is the best time to do the insufflation.

DR. JOHN A. SAMPSON, ALBANY, N. Y.—When Dr. Rubin's first contribution appeared I was interested in it for two reasons. First, I appreciated the fact that tubal insufflation was evidently a valuable diagnostic agent. Second, I thought of the dangers which might be associated with it. Some fifteen years ago I became interested in the changes in the shape of the uterine cavity caused by uterine myomas. I studied these changes by injecting the uterine cavity through the cervix with gelatin containing in suspension bismuth subcarbonate. Roentgenograms were made of the injected uteri. While injecting a uterus containing a myoma, obtained from a patient who was flowing at the time of the operation, I noticed that the injection mass escaped from the ends of the severed uterine veins. I therefore became more interested in the dissemination of material from the uterine cavity into the venous circulation than in the changes of the shape of the uterine cavity caused by myomas. I made several experiments and found that if the patient was bleeding at the time of the operation and the uterine cavity was subsequently injected with the gelatin mass it would at times escape into the venous circulation, and also if the mucosa was curetted away from a nonbleeding uterus and then the cavity injected, the mass would invariably escape into the venous circulation. It must be obvious, therefore, that if insufflation is done on a patient who is bleeding or following a curettage that there is likelihood of some of the contents of the uterine cavity being forced into the venous circulation, whatever the contents may contain, bacteria or cells. On the other hand, I judge that there is no danger as long as the patient is not bleeding at the time of operation or the insufflation is not preceded by curettage or there is no great trauma caused by the insufflation.

In regard to peritoneal endometriosis following insufflation, it may be stated that if uterine and tubal epithelium escaping into the peritoneal cavity cannot become implanted on the peritoneum there is no danger from this source. The evidence indicating the possibility of uterine and tubal epithelium escaping into the uterine cavity and becoming implanted on the peritoneum, is most convincing to me. I fully realize, however, that this evidence is entirely circumstantial. I might add that the evidence of cancer cells escaping into the peritoneal cavity from the perforation of a malignant ovarian cyst and becoming implanted on the peritoneum is also entirely circumstantial. I believe that the danger of foreign material escaping into the venous circulation and into the peritoneal cavity during tubal insufflation, if we follow the rules given by Dr. Rubin, is exceedingly slight.

DR. ROBERT L. DICKINSON, NEW YORK, N. Y.—I find that in a very large proportion of cases, as shown by my glass tube, there is blood in the tube and I am ready to substantiate the fact that there is some bleeding into the tube even with smooth edges to the perforations at the end. This does not occur often, however, in the secondary sterilities, where the internal os is wide open, but it is mostly in the anteфлекed or infantile uteri with the small internal os that this oozing occurs.

DR. GEORGE GRAY WARD, NEW YORK CITY.—Dr. Rubin's procedure has been carried out in a great number of cases at the Woman's Hospital with practically no serious mishaps. The method is so valuable that we cannot, in my judgment, possibly dispense with it.

There is a small point in the technique that I have always felt was very important and that is to be very sure at the time of the insufflation that the cervix is quite dry and thoroughly clean. Very often it may be full of mucus and secretion and it has been my practice always to utilize a suction apparatus. You can clean the cervix very well and dry it quite thoroughly before making the insufflation by this means.

DR. ROBERT L. DICKINSON, NEW YORK, N. Y.—May I say that when I found such great fear of this insufflation process in Germany in 1926 I visited some of the clinics and some patients were insufflated that we would not have touched here, with nasty looking cervixes, and it was very plain that their fears were due to results of such improper application of the Rubin method.

DR. LILIAN K. P. FARRAR, NEW YORK, N. Y.—I have found it a great help in locating the canal of the cervix and shortening the time needed to use the gas, to employ a sound and Hanks dilators which produce no bleeding in the cervical canal, and in that way one can more gently open the cervix.

DR. RUBIN (closing).—A similar attack of epilepsy to that referred to by Dr. Dickinson occurred in my own practice. We are rather careful in inquiring whether a patient is prone to attacks of syncope. In this case the patient's history had not indicated that she was subject to epileptic seizures. She apparently did not realize that she was an epileptic but her husband has picked her up from the street several times and she always carried an identification card. Slight attacks of syncope occurred after insufflation in a few cases but I do not believe they can be credited to any trauma.

The experience of the Woman's Hospital has been to me the greatest source of satisfaction because under an impartial observation, there the method has had a chance for evaluation.

16. **Postoperative Obstetric Embolus**, by Dr. John O. Polak, New York, N. Y. (See page 529, October issue.)

DISCUSSION

DR. LILIAN K. P. FARRAR, NEW YORK, N. Y.—I have looked up the record of the Woman's Hospital for the five years ending December 31, last. In 6712 confinements in 5 years, there were 2 deaths from emboli (0.02 per cent), and in 8930 operations in 5 years, 6 deaths from emboli (0.06 per cent). As to the type of operation, we found emboli and phlebitis most frequently after hysterectomies for large fibroids and in cesarean sections. These are the types of cases which have large veins which are due to the distension produced by a large tumor or pregnancy.

The most important causative factors are endocarditis and myocarditis. The patients are usually obese. The damaged heart is most frequently the cause of a pulmonary embolism. Anemia I would put as a second cause. In going over this series it was noted that many of these patients had a hemoglobin of 40 to 60 per cent or lower and, of course, the leucopenia that goes with it. Thus they are not in good shape to stand a long operation. An operation that runs over an hour puts a patient in a more critical condition. In the operation that lasts two hours you can look for trouble and usually will find it.

Deoxygenization of tissues is what I call shock. We get the clinical symptoms when there is a drop in pre- and postoperative blood pressure of 25 or more points.

The blood pressure taken just before the anesthetic may go up several points due to the nervousness of the patient. We do not consider a slight fall in blood pressure as a serious thing. If we were to say a fall of blood volume it would express more accurately what the condition is and what we should try to remedy.

Dr. Polak has spoken of the sacculation of the veins as the source of the trouble. With the drop in the blood volume there is at the beginning, certainly for a time, a normal relation between the blood cells and the plasma. Then the red cells pass out into the capillaries. The plasma leaks out from the capillaries, then there is a deoxygenization of tissues and the vicious cycle begins. There is a viscosity in the veins then, and in this way a thrombus forms. Small tributaries going into rivers make a pool back of the small stream. In the same way the small veins entering into the larger ones make a favorable spot for a thrombus to form. If there is an obstruction to one side or the other there will be an obstruction in the stream. There we get a sacculation when there is a lowering of the volume of the blood vessel and we then have a very favorable condition for thrombus formation. With the loss of the blood volume, blood platelets increase in large numbers. A cohesion and then a coagulation of cells forms in the veins. That is the time of danger. I doubt if getting a patient up early lessens the chance of embolism in the least. I am more inclined to believe it promotes it because when the thrombus has formed and runs out transversely across the vein and begins to get into the blood current, then comes the danger of a snap and of the clot being carried to the brain or lung.

Now the preoperative prevention I believe is in getting the patient into better condition. We send a good many of our cases with any question of heart or obesity to be examined by a cardiologist but they will give an opinion on only ordinary conditions. I do not think they allow enough for the danger there is in an operation. In the anemic cases, the poor risks, the cases with a leucopenia, we give blood transfusion and then endeavor to maintain their blood pressure. The treatment which I have used for ten years is gum acacia 6 per cent and glucose 20 per cent. I prefer to give it as a prophylactic during the operation and I give it at the rate of 4 c.c. per minute. The intern is on the watch to see that there will not be an excess thrown into the blood stream. No harm is done by putting in an excess of glucose or acacia but it then becomes a diuretic and is carried off into the urine with the body fluid, and that is the only danger.

I have tried to get the figures of glucose and acacia treatments as several have asked for them. Until three years ago at the Woman's Hospital, the glucose and acacia and blood transfusions did not have a separate index, so I had to go to the purchasing clerk who says that we have purchased 700 flasks of gum acacia and glucose solution in five years. I asked Dr. Lyon, the attending obstetrician, how freely he used it and he said "in every case of shock and every transfusion while we are waiting to match and type the donor." I cannot give you the actual figures in the cases where it was used but no case in the obstetric ward had either emboli or thrombophlebitis after using gum acacia. There was one case that was delivered by a courtesy surgeon. The patient had an active hemorrhage, was given gum acacia, transfused, and returned to her room in excellent condition. The uterus was not packed and later the patient had a severe hemorrhage and passed out. That was the only casualty.

Of sixty gynecologic cases there were seven who had gum acacia and glucose given for postoperative shock, given from one to twenty-four hours after the patient left the operating room. There was no death, no emboli in these seven mild thrombophlebitis cases and we had no other casualty. In my opinion, the thrombus forms while the patient is in shock and not days afterward.

Of the cases receiving glucose throughout operation as a prophylactic for shock, one died eighty-eight days after operation. She had an operation for inoperable

abdominal myxosarcoma. Autopsy showed an endocarditis and a recent red clot in the pulmonary artery.

In one case was a small amount given while doing a hysterectomy. She was an emaciated patient who was operated upon for carcinoma of the fundus. The internist who saw her several days after the operation made a tentative diagnosis of cerebral emboli. The patient went home absolutely well on the thirty-fourth day. If we exclude those two cases, then no case receiving glucose and gum acacia throughout the operation (anywhere from 300 to 500 c.c.) had any untoward results. I believe that the gum and glucose treatment has been the greatest preventive that we have against thrombus and emboli.

DR. GEORGE W. KOSMAK, New York, N. Y.—The subject which Dr. Polak has brought before us has been discussed at many meetings and yet in his excellent manner of presentation he has made it a very interesting topic, and we are indebted to him for confirming his observations by such a large number of cases. I simply want to refer to a few points that impressed me in his paper.

One is the question of diagnosis. It seems to me that both in operative and obstetric cases we are too ready to accept the diagnosis of embolism when a fatality takes place, and I believe we should examine more carefully the histories of these patients and determine whether death was actually caused by embolism or by something else. In my experience at the Lying-In Hospital in former years, where I saw a moderate number of these cases, one point always impressed itself upon me and that was the sudden elevation of pulse and temperature at any period after delivery, varying from a few hours to a few days, for which nothing else could be held accountable except a possible embolus. With that sudden elevation of pulse and temperature, there always came a complaint of pain which was referred to the chest. Accompanying that, of course, there was more or less dyspnea. Those are the symptoms that we should always look for in making a diagnosis of embolus, particularly in the obstetric patient.

Now as Dr. Polak has said, prevention is the important thing both in operations and in obstetric deliveries. I believe digitalization of the patient is one of the most important. Many of these patients have a peculiar flabby heart, particularly the fibroid patients, and the administration of digitalis for a few days before operation helps them considerably, I am sure, in getting over the tendency to thrombosis. This digitalis administration should also be continued after operation although the drug may then be given in smaller amount. Another point in the prevention of thrombosis is extreme delicacy in handling the pelvic contents as well as in handling the abdominal wound. A great deal of trauma results from making a wound larger than actually required and from the insertion of large and improperly protected retractors.

Another thing: I believe that the use of a transverse suprapubic incision whenever it is possible to employ this, is a preventive against traumatization of the abdominal contents. The use of clamps and various instruments to pull up the uterus in order to suspend it or to subject it to inspection, should also be avoided. The hand is likely to do much less damage to a uterus that is to be left in place and do much less damage to possible varicose veins in the broad ligament than the grasping instruments often employed for this purpose.

The use of crushing clamps, especially in hysterectomies, is also a causative factor and it would be better if we isolate bleeding points and ligate them with a catgut suture on a needle than to use freely the large broad surfaced clamps. If you inspect those crushed areas you can readily see the small clots that have resulted from these instruments and which later may be dislodged and swept away.

One of the important preventive factors to be taken into consideration is the early voluntary movement of the patient, whether it be after an obstetric delivery or an abdominal operation. These patients should be encouraged to move about in

bed and you can reassure them that it will do no harm and that the wound will not open, especially in a transverse incision. They may move their arms and legs and the head from side to side as much as they please. This contributes to the comfort of the patient and I believe avoids embolism.

We have had an opportunity in New York since the first of the year of making a very close study of the puerperal deaths, the certificates being forwarded to a committee within one week after the death occurs. Then we have investigators who go out and look up the case. The diagnosis of embolism is quite a frequent one. We find embolism put down at different days of the puerperium, from the first to the tenth. That is a subject that we want to go into more thoroughly because the committee believes that in many instances it is a false diagnosis and that there are not so many embolic deaths. It is necessary, assuming that an obstetrical patient dies from an embolus, that the attendant circumstances be carefully looked into. We feel that in many of these cases where embolism is assumed to be the cause of death that the underlying cause is probably a septic process and that we are not dealing with an ordinary embolus. I hope that by this time next year we will have some further data on this investigation and be able to come to some conclusion at least as to what actually happens in these cases. It is such an easy way to get out of a more or less compromising situation and I fear that many men who have been unfortunate enough to have had obstetric fatalities have resorted to this diagnosis as an excuse.

DR. REUBEN PETERSON, ANN ARBOR, MICH.—I have been very much interested in this subject from a number of standpoints. In the first place, in regard to its frequency. When we have one of these deaths from thrombosis or embolism it is such a shock that we think it is more frequent, I believe, than it really is. I have looked up the incidence in gynecologic operations at the University Hospital in the last five years. There were in all 2,242 operations and these I have divided into minors and majors; 1,515 minors of various descriptions and 727 major operations. There were four sudden deaths in all, giving an incidence of 0.1 per cent, and yet in spite of that low incidence compared with what Dr. Polak and Dr. Farrar found, I thought it was much larger because I was so impressed by these deaths.

There were three deaths in the major group, that is, in 727 cases, which gave a percentage of 0.4; in the minor group, as one would naturally expect, it was 0.06 per cent. I found the ages of these four patients interesting since I thought that thrombosis and embolism were much more common in the aged; yet the first patient was thirty-seven years of age, the next forty, the next forty-eight, and only one was above sixty.

I am particularly interested in the point that Dr. Kosmak brought out regarding diagnosis. How are you going to make a diagnosis if the death has been very sudden unless an autopsy was done? I wondered how many autopsies Dr. Polak had in order to arrive at his conclusions? In a recent case, not included in these statistics, the death came within a very short time. The internists were summoned immediately. One internist made a diagnosis of coronary thrombosis and the other thought it was an embolus. Autopsy showed that it was neither but that this sudden death coming eleven days after the operation was due to a weakened myocardium and the sudden distention of the right auricle.

In another recent case, a young woman had a very minor operation on her toe. She died suddenly under the anesthetic. I was able to secure only the heart for autopsy. She did not die from the anesthetic but from a myocarditis and weakening of the heart muscle. The anesthetic was no doubt the immediate cause of the death, but death was really due to the myocarditis and distention of the right auricle.

I find that this condition is most common in patients with fibroids. Some years ago I wrote an article on gynecologic and obstetric risks. That has been a great help to us in our work because each man has to state the risks before the operation is performed and sudden death from embolus must be reckoned with.

I believe, contrary to what Dr. Kosmak said, that it is a bad plan to let these patients up early. On the contrary, to avoid thrombosis and embolism, I have always made it a practice to keep them in bed longer than the usual practice.

In conclusion, in judging whether a patient is a good or poor risk, we can depend upon the internist so far as the gross lesions of the heart and other organs are concerned but we cannot depend upon him at all in regards to the risks of the operation because he has no appreciation of the risk of a gynecologic or abdominal operation. I take his findings and then decide myself about the risk.

I do not know how you are going to avoid these sudden deaths from thrombosis. In these four deaths that we had the patients seemed all right and yet they all died varying from the third to the eleventh day from what looked like a pulmonary thrombosis or embolus.

I asked the internist to give me a differential diagnosis between coronary thrombosis and pulmonary embolus and it was as follows: in coronary thrombosis the blood pressure is lowered, while in pulmonary embolus the blood pressure is not affected; second, in coronary thrombosis the pain is very severe in the median line, while in pulmonary embolus the pain is more lateral, less severe, and the patient has no such radiation of pain to the shoulder and neck or the coughing that accompanies coronary thrombosis. But when the death is almost instantaneous no differential diagnosis can be made. It may be pulmonary embolus, coronary embolus, or neither but sudden death from heart-block from a weakened myocardium. Only by an autopsy can an exact diagnosis be made.

DR. GEORGE W. KOSMAK, NEW YORK, N. Y.—I did not mean to convey the idea that I approved of patients getting up early, but I do approve of voluntary movements in bed.

PROF. FELIX VON MIKULICZ, BERLIN, GERMANY.—Dr. Polak's paper was very interesting to me because we have in Germany much more embolus and thrombosis than you have here in America. The statistics from Stoeckel's Clinic show that about 50 per cent of all deaths are caused by embolus. Now it is a question what is the cause of the embolus. Many cases that die from embolus do not show any change in the blood; in other cases where the patients are quite well there are great changes. These lesions are probably caused by poor circulation together with infection. During the hard times in Germany between 1922 and 1926, the women have had much work to do that was not good for their health. They did not have much to eat and had great worry. Specialists of the heart cannot tell us whether the patient's condition is favorable for operation or not. Because of that we do two things: we try to improve the patient's health before operation, and we administer digitalis after the operation. Gymnastic exercises are also given and we believe that the number of cases of embolus has been lowered somewhat.

Because we have so many patients with embolus, we have tried the Trendelenburg operation. I have now five cases that were cured by this operation and I hope we shall see great benefits from this in the near future.

DR. FRANCIS C. GOLDSBOROUGH, BUFFALO, N. Y.—I would like to ask the number of cases in which the embolism was proved by postmortem examination.

I think there is nothing more difficult clinically than to tell whether the patient who has a sudden disturbance has an embolus or some other ailment. As Dr. Peterson says, we see cases clinically that we are sure are cases of embolus and

yet at postmortem we cannot find this condition. In trying to follow up the cause of death I think the whole mistake is made from the clinical picture without being able to prove it pathologically.

DR. POLAK (closing).—There is no question in my mind that pelvic varicosities are induced by fibroids, pregnancy, and retrodisplacements and are predisposing factors. You will ask why. Clinical observation in this class of cases proves that it does occur.

In answering Dr. Goldsborough's question, 23 of these patients out of a total of 61 were autopsied; this included most of the gynecologic cases.

It is difficult always to find the clinical symptomatology which has been given us by Dr. Peterson and which, of course, will help us in the future.

With Dr. Farrar I believe that a proper circulation is better able to take care of an extra strain than a circulation that is sluggish, knowing that the leucocytes and platelets are always increased in these cases.

All of these gynecologic patients were routinely digitalized prior to operation.

Dr. Kosmak also spoke of early movement for the patient and to substantiate its value we might refer to the lack of thrombosis and embolus in children. Otologists find that children are often seen with an immense thrombosis of the lateral sinus and yet these little patients never have an embolus, and of course you know how active these children are, and how the circulation of the child differs from the circulation of patients 40 or 50 years of age.

I would like to say that I agree with Dr. Peterson in his remarks about the cardiologists. They can tell us whether the patient has a lesion but they cannot tell us what that heart is going to do under operation. When they tell us that a heart is perfectly good for operation we have a test of making the patient go up to the third floor and come down again and then taking the pulse and blood pressure. Those that do not stand the physical test are not operated upon.

17. **Paralysis of the Bladder, With Distention and Hemorrhage Immediately Following Catheterization**, by Dr. Dougal Bissell, New York, N. Y. (Paper read by title, see page 811.)

NEW YORK OBSTETRICAL SOCIETY

MEETING OF MAY 13, 1930

DR. BURTON J. LEE presented a paper (by invitation) entitled **Significant Problems for the Obstetrician in the Field of Mammary Cancer**. (For original article see page 775.)

DISCUSSION

DR. HUGH AUCHINCLOSS.—Dr. Lee's remarks on the importance of making careful clinical previous study and the use of large topographical sections in studying cancer of the breast are of great importance, and particularly is this true where the study of the breast is being made from the standpoint of the spread of the disease and from the standpoint of changes caused in any breast by radiation.

The Bateson operation for carcinoma of the breast has fallen into disuse. Not very long ago, I had occasion to operate upon a patient with carcinoma of the breast who had previously had both ovaries removed.

With regard to carcinoma of the breast and pregnancy, there is a rather universal feeling that pregnancy accentuates the spread of the disease. On the other

hand, the surprises that occur in carcinoma of the breast are associated with pregnancy as well as in other ways. One patient who had been operated upon several times with the mistaken diagnosis of a breast abscess, proved to have a carcinoma of the breast that had occurred during her lactation, following the eighth pregnancy. This was radiated and removed by me a few years ago. It was expected that in a few months this patient would be dead. It was a surprise to see the patient three months later having gained much weight and in apparently perfect health and starting another pregnancy. She refused to have an abortion done, was delivered of a nine pound child, and a few months later started another pregnancy. Following this pregnancy she developed signs of carcinoma of the lung on the same side, and two or three months later was dead. Dr. Maude Slye's work with mice suggests that pregnancy inhibits the growth of tumors, but that following pregnancy, carcinoma grows with increasing rapidity. The diagnosis of carcinoma of the breast during pregnancy and lactation may be a very different one, and it is extremely important that lumps that are suspected of being inflammatory at this time should be very carefully observed and explored.

One cannot emphasize too strongly that carcinoma of the breast is fraught with many surprises, for patients that are seemingly inoperable may remain well, and patients that are apparently curable by operation may die in a short time. The prognosis in any individual case is well-nigh impossible to make.

The one thing that dominates the whole subject of cancer of the breast is the importance of instructing every woman over twenty to intentionally feel the breast tissue with the fingers as she lies on her back, feeling the breast against the chest wall, every few weeks all her life. Cancer is entirely painless in its incipency, and unless the patient herself feels for a lump, cancer of the breast will never be recognized in its earlier stages. Periodic examination of women from twenty years of age to old age is impractical and needless. Two patients have died from metastasis of cancer of the breast at the age of twenty-three within the last few years at the Presbyterian Hospital. If this advice and practice could be made general, it would do more than any other one thing toward reducing the frightful mortality that occurs in this disease today. Most breast lumps are benign and it is wise to tell people this, but they should be warned that the minute they feel an area of induration of any sort, they should seek expert advice. They will never find them early unless they feel for them.

DR. W. C. WHITE.—I would like especially to commend Dr. Lee's attitude on inflammatory carcinoma of the breast, in pointing out the futility of operation in that type of case, as all the patients I have been in contact with, of that type, have died rapidly after radical operation. I did not believe what he said, at first, and practiced radical operation and now I have been enlightened.

I would also like very much to second his suggestion that this Society investigate the relationship of lactation to carcinoma of the breast. I know that it has been the practice of obstetricians in many of their fashionable patients to stop lactation very promptly, in a short time after the birth of the child, and, so, I think, in a group like this, they could very easily obtain information that would in a way be far more profitable than the experimental work of Bagg on rabbits.

In spite of all our improvement in operative and radiation technic, the fact remains that our good results in cancer of the breast are with the early cases. I would, therefore, urge the desirability of routine examination of the breasts whenever a patient comes to us with a pelvic condition. We all know that there is some relationship between the pelvic organs and the breast. Therefore, it is not an idle suggestion that gynecologists, especially, be on the lookout for small breast tumors.

In 1898 Halsted reported his experience with 133 cases of cancer of the breast. In only 6 of these was there freedom from axillary metastases. Conditions have so

improved now that we ought to expect at least half the cases to be localized and free from axillary metastases. But this very improvement has largely changed the clinical problem. Gone are the usual signs—retracted nipple, orange peel skin, adhesions to the superficial skin, palpable lymph nodes. Rather we have a small lump, 2 to 3 cm. in diameter, that has none of these signs. What shall we do? Dr. Lee has spoken of the newer methods suggested to meet this problem. Of these transillumination is of considerable value. Concerning the diagnostic needle puncture I am not enthusiastic. There is a good chance of spreading the cancer cells by blood stream and lymph channel with the puncture into the tumor. An additional objection is histologic. The diagnosis of breast cancer, by histology, is still largely a "geographical" one. We need a goodly section, so that we may see evidence of wild growth. I am not yet willing to base the diagnosis on the individual cancer cells, as advocated by MacCarty.

I am a strong advocate of biopsy by the diathermy knife with immediate frozen section. At the same sitting a radical operation may then be performed, when indicated.

In the treatment of cancer of the breast there is a school that is satisfied with radium treatment alone. Needles of the filtered radium element are inserted into the tumor and the common metastatic sites, to be withdrawn later, or else filtered radon seeds are put in permanently. I have yet to be convinced from my knowledge of breast anatomy and pathology that this is more than a haphazard method of cure. The radon seeds ought to be implanted accurately one centimeter apart in various planes, and a magician would be required to do this through the skin surface to areas 4 to 8 centimeters below. If a small area only is missed, the procedure has been futile, and a false sense of security has been obtained. How much simpler it would be to excise the tumor with a wide margin.

The history of breast surgery has been the story of the futility of incomplete removal. We know that a small nodule may early metastasize to the near-by axillary lymph glands. Therefore, the advocate of radium as a cure, logically, must destroy the lymph glands in the pectoral nodes, and in the axilla at the same time. I have had the opportunity to watch this technic at St. Bartholomew's Hospital in London. It did not appeal to me as accurate. It is fair to say that the results of this method are not yet known. As the hospital, under the leadership of Geoffrey Keynes, is using this method exclusively, in four or five years more we should have an interesting report.

A definite handicap to the use of radium is its cost and scarcity. The high voltage roentgen therapy machine is cheaper and relatively easy to acquire. As a sole method of therapy, it has now scarcely an advocate except for inflammatory carcinoma. As an adjunct, it has many supporters. Dr. Lee has been an enthusiastic supporter of its use as a preoperative measure. It has seemed to me that the reasons supporting this attitude were based on theories that did not sufficiently warrant the postponement of an indicated operation. In reference to its use, I am still a strong supporter, in spite of the adverse report of the special committee of the American College of Surgeons. It is easy to believe that, at operation, stray cancer cells are freed in the raw wound and that roentgen therapy may attenuate or destroy these cells. From clinical observations, it has not appeared to make any difference in the early case whether the roentgen ray is used or not. When it comes to the Steinthal groups 2 and 3, I believe that the average span of postoperative life has been increased.

I am still a believer in surgery of the radical type. Following Sampson Handley, one should remove at least five inches of skin in diameter and make a subcutaneous dissection for at least two and a half inches in all directions. Both pectoral muscles are removed. I am not convinced of the necessity for removal of the fascia over the rectus abdominis muscles. I have a feeling that most abdominal

metastases enter the abdomen from the mediastinum or the pleural cavities. This radical operation requires skin graft in about one-quarter of the cases.

DR. R. L. DICKINSON.—I would like to present a method of graphic representation that has served me well for a good many years in studying the breast and particularly chronic mastitis, and its bilateral character. The interesting thing to us is the fact that the chronically diseased breast grows or diminishes *pari passu* with the condition in the pelvis. If one finds a persistently or intermittently tender ovary, he might find a persistently or intermittently enlarged breast (sometimes ovary and breast on the same side) and one carries through these cases of chronic mastitis, for years or decades. If you trace with a skin pencil on the breast the outlines of the growth or of the breast tissue in a woman not too fat, place a piece of glass over that and trace on the glass with the pencil the outlines, and then transfer them to a piece of tracing paper, you get results of this kind. I have the history of a girl followed for twenty years with occasional increase and decrease, both breasts being affected; who was thus carefully watched. Surgeons have two or three times desired to do something about it, but when they have seen the tracings (about eighteen in her case), they have decided that that is at least a symptomatic enlargement. Here are other conditions of that kind, tracings carried over a period of several years on various breasts. Of the twenty or so that I have brought along some of them have been operated upon, and it is interesting to see that if one breast has been operated upon and the patient not thought vigorous enough to have the other done at the same time, the other breast has generally promptly shrunk. These cases have turned out to be almost altogether cystic mastitis, when bilateral.

DR., GEORGE G. WARD.—The gynecologist and obstetrician, of course, must consider the breast. At the Woman's Hospital Dr. Farrar has for a considerable period of time observed some of the nonmalignant nodules in the breast and has a number of cases where the apparent cause of the nodules appearing in young girls, was due to wearing a tight brassiere which gives them the flat chest to produce the slim figure so much in vogue. The tight brassiere interferes enough with the circulation of the breast to produce definite nodules. This apparently has been proved by correcting this and using a proper support for the breast, and on following the cases subsequently it has been found that these nodules have disappeared.

DR. H. C. TAYLOR, JR.—Earlier in the evening the President raised the question of whether cases of breast tumor belong to the obstetrician, the gynecologist, or the general surgeon. I have had the opportunity, after a little gynecologic training, of seeing quite a number of breast cases on Dr. Lee's service at the Memorial Hospital and have been impressed with the fact that no matter to whom the treatment of these cases belongs, the physiology of the breast is certainly wrapped up with that of the other organs connected with reproduction. For that reason I believe that the newgrowths of the breast must be considered from an etiologic standpoint in a group with certain tumors of the uterus and ovary.

It should be clear, however, that comparison of cancer of the breast can best be made with that of the uterine corpus, for in both sites one finds adenocarcinoma arising from a tissue which is greatly affected by the changes of the menstrual cycle and of pregnancy. No such similarity can be found between breast and cervix, for here one is dealing with histologically different types of cancer. It is therefore not justifiable to assume that because chronic inflammation is a factor in causing cervical cancer, it bears a similar relation to cancer of the breast. An interesting fact in regard to this relationship is that the incidence of cancer of

the breast and the uterine corpus is probably slightly higher among women who have not borne children, while cervical cancer of course is strikingly more frequent among those who have.

In regard to benign tumors Dr. Dickinson has already referred to certain cases in which there is an association of a painful lesion in the breast with a painful ovary. Such painful breasts probably bear a close relation to the so-called chronic mastitis. It is probable that if this relationship between breast and ovary is followed up and the breast considered as a part of the reproductive system, much more progress can be made in the understanding of the etiology of breast tumors than is possible if one continues to regard them as having an inflammatory basis.

DOCTOR LEE (closing).—Carcinoma of the breast occurs with considerable frequency in young women. We have reported the results in 306 cases treated three years or longer at the Memorial Hospital. Radical amputation plus irradiation gave 16 per cent alive and without disease at the end of three years and 9 per cent at the end of five years. Diagnostic errors are more often made when no skin adherence is evident. Under these circumstances a small infiltrating cancer may be mistaken for a fibroadenoma. In the presence of chronic mastitis, one should remember that carcinoma may develop in a cyst. Therefore, patients with chronic mastitis should be seen at frequent intervals, keeping such a possibility in mind.

Transillumination, developed by Doctor Cutler, is a simple method of examination and a valuable diagnostic aid. The Cameron cold light placed behind a moderately pendulous breast illuminates the entire gland. A cyst containing blood is readily recognized as a dark shadow. Transillumination may reveal a cystic tumor which cannot be palpated.

Doctor Adair, my associate at Memorial Hospital, has reported a considerable series of cases with bleeding nipples. He concluded that 50 per cent of such cases are true carcinomas, confirming a similar finding by Dean Lewis.

Papillary cyst adenoma is often the cause of bleeding nipple. If palpation does not enable one to feel the tumor, its site may be demonstrated by finding the point at which pressure will cause a discharge of blood or serum from the nipple. When both of these methods fail, transillumination may reveal the cyst. A wide local excision of such a lesion should be carried out, an accurate histologic diagnosis being made in the operating room, for papillary cyst adenomas not infrequently undergo carcinomatous degeneration.

Doctor White has introduced the subject of the effectiveness of preoperative irradiation. When cancer is highly radiosensitive, a considerable cellular change will occur and the tumor will regress. With radioresistant lesions, preoperative radiation may accomplish little in tumor devitalization. If the operation is postponed for about four weeks, some degree of vascular change may be noted in and about the tumor and the cellular changes at that time are more pronounced. In the cases which we have followed it appears to us of considerable benefit. Complete devitalization of a tumor can be brought about only by delivering to it the equivalent of 10 to 12 full erythema doses by means of radium used interstitially.

Doctor Dickinson's graphic charts seem to provide an excellent method of keeping case records in this type of disease. Doctor Ward has brought up the question of the effect of a tight brassiere upon breast tissue. We have seen quite a number of cases of true mammary cancer in which a tight brassiere appeared to be one of the causative factors. Chronic mastitis may be induced by this mode of dress.

BROOKLYN GYNECOLOGICAL SOCIETY

MEETINGS OF APRIL AND MAY, 1930

DR. JOHN J. MADDEN reported **Two Cases of Postoperative Parotitis.**

The following cases represent two different types of the disease, the first requiring incision and drainage and the second resolving itself, drainage taking place through Stenson's duct.

CASE 1.—A twenty-four-year-old white woman, mother of a baby four and one-half years old, was admitted to the Obstetrical Service of The Brooklyn Hospital because of vaginal bleeding and abdominal pain.

The history and physical findings warranted a diagnosis of ruptured ectopic pregnancy and operation confirmed this. The left tube and ovary were removed. The day following operation, there was a sharp rise in temperature to 104° F., and a few hours later the patient complained of pain at the angle of jaw and there was some swelling of the right parotid gland which progressed until, four days later, the right eye was closed, the jaws were almost closed, and there was considerable edema down the right side of neck. Incision and drainage of the gland was done at this time and marked improvement noted in twenty-four hours. There was very little discharge from the wound but the swelling diminished rapidly and pain subsided so that three days after operation the temperature was normal and patient very comfortable. On March 5, 1930, the wound was still discharging slightly.

CASE 2.—A forty-nine-year-old white woman, married, was admitted to the Gynecological Service of The Brooklyn Hospital with a diagnosis of fibromyoma uteri. Operation a few days later confirmed this and the uterus, tubes, and ovaries were removed. Forty-eight hours following operation there was a sharp rise in temperature to 103° F., and for the next six days there was some fever. A few hours after the initial rise in temperature, the patient complained of pain on right side at angle of jaw, increased by its movements. Swelling of the right parotid gland was noted and some edema extended down the right side of neck. The following day pus was found discharging from Stenson's duct. There was some degree of fever for six days and some swelling for two weeks.

DR. HENRY S. ACKEN, JR., reported **A Case of Ruptured Corpus Luteum Cyst With Intraabdominal Hemorrhage.**

On October 29, 1929, there was admitted to my service in the Methodist Episcopal Hospital of Brooklyn a young married woman twenty-three years of age. She had had an attack of lower abdominal pain, commencing very suddenly, and continual "gas" pains. She had been married five years and had gone through two pregnancies. The first occurred three years ago, and terminated in an abortion before the third month. Following this abortion she had fever and abdominal pain which confined her to bed for several weeks. During the next pregnancy the following year she was under my care. This pregnancy ended in a missed abortion and a dilatation and curettage was necessary. This time she made an uneventful recovery. Since that time she had come sporadically to my office for treatment of vaginal discharge due to a moderate endocervicitis. About seven years ago she had had an appendectomy, and during the past two years she has had several

attacks of severe right-sided pain which could at the time be explained only as due to her previous operation. Menses commenced at the age of thirteen and until two years ago had been regular, at thirty-day intervals and lasted five days, without pain or unusual discomfort. For the past two years menstruation has been quite irregular and frequently very painful.

The present illness began in the morning of October 29 with a sudden cramp-like pain in the lower abdomen. This pain was of sufficient severity to cause her to fall to the floor. When I saw her at home, three hours after the onset of her pain, she was lying in bed complaining chiefly of "gas" pains. She did not appear acutely ill but her abdomen was quite tender and showed a moderate amount of tension. Vaginal examination revealed a tender cervix but no pelvic masses. Bowels had moved normally that day and there was no vomiting. Her menstrual period had been due two days previously but there had been at that time only a slight blood tinged discharge. After the onset of the present symptoms there had been another such discharge which lasted but a few minutes. Because of the history and findings hospitalization was urged.

On examination in the hospital, four hours after her initial attack, she seemed more acutely ill than she had been at home. Heart and lungs were negative. Abdomen was tense and extremely tender, particularly in the lower portion, though there was no definite localization. Even light pressure on the abdomen caused nausea and once or twice vomiting. Vaginal examination was not entirely satisfactory because of the pain it elicited. The introitus was nulliparous, vagina apparently normal and without discoloration, and cervix exquisitely tender on motion. The uterus seemed to be of normal size and quite freely movable except for the pain it caused. There were no masses palpable in the pelvis and the adnexa could not be felt. The temperature was 98.2°, pulse 100, and respirations 22. The red blood count showed 3,900,000 red cells, with 71 per cent hemoglobin, white blood cells 16,000, with 76 per cent polymorphonuclears. The sedimentation time was one hour and fifty minutes. The urine showed a faint trace of albumin. The blood pressure was 90/60.

The patient was observed closely during the period required for the sedimentation time. She became more anxious and the pain more severe. Her pulse rose to 120 and her blood pressure dropped to 75/50. Undoubtedly there was an intraperitoneal hemorrhage. The condition was considered to be a ruptured ectopic gestation and therefore operation was advised.

A midline incision showed free blood in the peritoneal cavity. The right ovary and both tubes were normal and the uterus showed no signs of pregnancy. The left ovary, however, was of slightly increased size and there was on the periphery the remains of a cyst with a rent in its wall two to three centimeters long. The base of the cavity thus formed was dark in color and there was some free bleeding from it. Approximately a pint and a half of blood, including clots and free blood, was removed from the abdominal cavity. The left ovary was resected, the abdomen closed in layers, and the patient made an uneventful recovery. She menstruated normally and without pain beginning the second day after operation.

The pathologic examination of the specimen showed the cyst wall to be composed of fibrous tissue with a lining of lutein cells.

This case was interesting because of its comparative infrequency. Uncomplicated corpus luteum cysts are not uncommon but the rupture of one with consequent bleeding into the peritoneal cavity sufficient to cause the symptoms noted, is unusual. Search of the literature revealed comparatively few cases of rupture of the corpus luteum or graafian follicle with anything like the symptoms found in the case presented here. Ladinski, R. R. Smith, Bovee, Adams, and Sydney report single cases and Brakeley and Farr report a series of thirteen cases. In no in-

stance was the correct diagnosis made before operation. Acute appendicitis and ruptured ectopic pregnancy were the most common diagnoses.

DISCUSSION

DR. SAMUEL A. WOLFE.—Contrary to views formerly held, rupture of the follicle prior to the formation of the corpus luteum is not attended with bleeding into the cavity of the follicle. Pathologic hyperemia of the ovary as the result of inflammation, fibroids, or displacement of the uterus accentuates the pathologic bleeding resulting in the formation of lutein hematoma, frequently associated with cystic formation. Clinically the lutein cyst-hematoma presents two interesting clinical pictures. The most common form is associated with a delay of the expected menstrual period for several days when the patient is suddenly seized with pain in one or other lower abdominal quadrants, associated with vaginal bleeding. Pain is the result of hemorrhage into the corpus luteum. The vaginal bleeding represents delayed physiologic menstruation appearing with involution of the corpus. These cases are frequently admitted to the gynecologic services as suspected ectopics. Culdesac puncture reveals the absence of blood. A large ovary is generally found which is the seat of a lutein cyst-hematoma. The second clinical picture of lutein hematoma is reproduced when bleeding into the corpus luteum is so massive as to cause external rupture of the lutein layer with the entrance of free blood into the abdominal cavity. This appears in the interval or just at the close of the menstrual cycle. The patient is seized with severe abdominal pain and passes into the condition of collapse. In both groups the pathologist can be of service in the differential diagnosis. Examination of curettings in lutein hematoma will reveal normal endometrium; cases of early ectopic will show decidual formation.

DR. GEORGE G. COCHRAN, JR., reported a case of Leucoplakic Vulvitis and Cancer of the Vulva.

This is a relatively rare disease.

In recent literature, there have been several articles, some of which recommend surgical treatment, and some radiotherapy.

A sixty-four-year-old, white, married woman, was admitted to the Gynecological Service of the Brooklyn Hospital in December, 1929, with a complaint of pain and swelling of the labia minora, of one year's duration.

For a number of years she had experienced an intense itching and burning after urination, about the vulva, but no pain until about one year previous to admission. She noticed, with the onset of pain, the swelling in the right labium, which had progressively become worse. There had been no bleeding.

Cholecystectomy was done two years ago. No pregnancies. Menopause seventeen years ago. General physical examination was essentially negative, except for a heart lesion.

Pelvic Examination.—Small atrophic fundus and cervix found on bimanual examination, with no masses palpable in the adnexal regions. The right labium was thickened, hard, ulcerated, but freely movable on the underlying tissue.

The clitoris was entirely covered, and also movable. The left labium was enlarged, red and inflamed, but not ulcerated. The general process seemed to be extending into the vagina.

The vulva was generally involved in an old chronic leucoplakic process. The skin in spots assumed a thin parchment-like appearance, with patches of greater thickness and whiteness, and numerous superficial excoriations, produced by the scratching.

Laboratory findings, including Wassermann test, were all negative.

A diagnosis was made, in conjunction with the Dermatological Department of leucoplakia and carcinoma of the vulva.

Under general anesthesia incisions were made on both sides over the inguinal canal, and extending downward and posteriorly, and about one inch outside of the labia minora, so as to remove the leucoplakic areas. Another incision was made just within the vagina and to surround the urethra. The labia and clitoris were amputated, together with the underlying tissues and superficial fat, and the glands over the inguinal region. By freeing the skin edges, closure was easily accomplished. The mucous membrane of the vagina and the skin outside the area were approximated with interrupted chronics, isolating the urethra.

A complete Bassett operation removing the deeper glands was not done, because of the heart lesion.

Pathologic Report.—Labia minora were both thickened and covered with a thick white epithelial covering, and one portion was hard, ulcerated and warty. On section, the stroma of the labia was not grossly infiltrated. The masses of inguinal fat showed no glands.

Histology.—A diffuse leucoplakial and a definite carcinomatous process was present. There were isolated islets of epidermoid carcinoma in the supporting stroma of the vulva.

Convalescence was uneventful, wounds healing primarily.

On March 28, 1930, the wounds were healed, and the patient no longer complained of the intolerable itching.

DISCUSSION

DR. WILLIAM SIDNEY SMITH.—This case again brings up the question: What is the best way in which to treat these cases, by surgery, or by radium?

The cases which I have seen and treated by radium showed a tendency to recur, and they also had intolerable pain and itching. In a recent case which had carcinoma of the vulva which had been treated by radium, the result seemed perfect, but the patient was in agony from pain and itching around the vulva. A few months later the growth recurred. I recall a case that was referred to me a few months ago for treatment of carcinoma of the vulva. Not having radium in proper form to treat the case, I sent her to Dr. Healy at the Memorial Hospital, thinking he would use radium. I saw him a few weeks later and asked him how he treated the patient, and he said he had decided to resort to surgery at once and excise the growth.

DR. JOHN O. POLAK.—My experience is in complete agreement with what Dr. Smith has just said, namely, that radiotherapy in these cases has been fruitless, and while we have apparently cured them, the patients are not relieved of their pain or their itching.

The results obtained by Taussig are unparalleled. If you are not expert in doing the entire operation at one time you should do what he used to do before he became expert. His first operation was a bilateral adenectomy, doing the extensive Bassett operation, and supplementing that within two weeks with a vulvectomy.

Furthermore, I want to emphasize that these leucoplakias are best treated only in one way, and that is by excision, if you want to give these women relief, and a large number of them become the seat of carcinoma. In following through a number of these leucoplakias I have seen carcinoma develop and have regretted that I did not operate at the time, because of the insignificance of the lesion.

DR. WALTER T. DANNREUTHER.—In the treatment of leucoplakia my best results have been from electrocoagulation, using from 50 to 250 milliamperes of diathermy current. One such case was done four months ago. The patient re-

ported the other day, completely free from all symptoms, and with a healthy granulating surface replacing the lesion. In that instance I did not spare the clitoris and coagulated everything, doing not only a surface coagulation, but introducing a needle electrode deeply into the tissues to create a wall of coagulation well beyond the outer margin of the leucoplakia. It is important to seal the lymphatics in this manner. It is too early to allow a report of the definite results from this therapeutic method, as a period of five years has not yet elapsed, but I feel sure that the results will prove infinitely better than after radium treatment, which I have now given up entirely.

Electrocoagulation is certainly a much simpler procedure than the extensive dissection involved in the Bassett operation. In my experience, the symptoms have been relieved just as promptly, and it is surprising how soft and pliable the surface is after healing is complete.

In answer to Dr. Polak's question, I may say that I am not only referring to cases of leucoplakia, but also those manifesting beginning carcinoma. I believe that if the inguinal lymph nodes are already enlarged, it is quite likely that the deeper lymph glands are also affected, and the patient will be little benefited by such an extensive and bloody procedure as the Bassett operation. This is only my personal opinion at the present time, and I may change it later.

DR. SAMUEL A. WOLFE.—Under the microscope leucoplakia is a precancerous lesion, presenting a definite hyperplasia, and yet most of us have seen the end stages of leucoplakia terminating uneventfully into benign kraurosis. Formerly it was believed that leucoplakia and kraurosis were two definite and distinct diseases, but newer studies have demonstrated that kraurosis is the end-result of leucoplakia.

Another factor in vulvar carcinoma is the extensive lymphatic metastasis as illustrated in the case report. Early metastasis and the resistance of the carcinoma to radiation make this type of tumor unsuitable for radium therapy.

DR. JOSHUA RONSHEIM presented a report on the **Maternal Mortality in the Jewish Hospital of Brooklyn**. (For original article see page 816.)

DISCUSSION

DR. ABRAHAM KOPLOWITZ.—It seems to me that rectal examination, in the hands of the majority, is still a safe procedure, and I do not believe that pushing the vaginal wall into the cervix is something that should be feared. The purpose of the rectal examination is to establish the amount of dilatation. Vaginal examination, however, even if carefully done, seems to carry with it a little more danger than the rectal examination.

The three layer sutures in cesarean section, after all, mean proper peritonealization. I agree that you accomplish with that a great amount of protection in the classical operation, but still I do not believe that you can accomplish as much as you do with the two-flap operation, which is a cervical operation in the main, although the body is quite often involved. The chances of infection are thereby minimized.

CHICAGO GYNECOLOGICAL SOCIETY

MEETING OF MARCH 21, 1930

DR. EDWARD L. CORNELL reported a case of **Neonatal Membranous Obstruction of the Duodenum.**

The mother of this baby was Mrs. A., para i, aged forty-one years, married nineteen years, last menstrual period July 13, 1929, and due April 20, 1930.

During pregnancy she had slight nausea and some bleeding from the nose. Pelvic measurements were 25, 28, 33 and 21, with a diagonal conjugate of 12+. At the eighth month she developed polyhydramnios. On February 21, x-ray examination revealed a single vertex presentation.

On March 12 at 10:00 A.M. a 6 cm. bag was inserted. The blood pressure was 130/75, and the temperature 97° to 99°. At 4:30 P.M. the bag came out, there was 6 cm. dilatation and pains had ceased. At 5:10 P.M. she was given 10 minims of intranasal thymopitocin. Within five minutes she began to have strong contractions, and at 5:55 P.M. dilatation was complete. At 6:27 P.M. with episiotomy a baby boy was born, weighing 2755 grams. It cried vigorously. The placenta was removed manually because of an hourglass contraction of the uterus.

On the second day the baby began to vomit water and dark colored fluid. Severe icterus appeared on the fourth day. On the fifth day the child became cyanotic and died on March 17.

Autopsy disclosed a membranous obstruction of the duodenum at the level of the papilla of Vater. The ductus choledochus entered below the obstruction as a fibrous cord approximately 4 cm. long. The small intestine below this obstruction was normal in size. This accounts for the severe icterus and the marked vomiting. There are only six cases of this type of obstruction in the literature. (See *Archives of Pathology*, 8: 611, 1929.)

DR. CHARLES B. REED discussed **Avertin Anesthesia in Obstetrics.**

Tribromethylalcohol, or avertin, which has had wide usage abroad in surgical cases, is soon to be available for obstetric work in America. Being a rectal anesthetic, it obviously has many advantages.

Avertin is a white crystalline powder which is readily soluble in water at a temperature of 104° F., but demands protection against light and air.

Absorption by the bowel is quite rapid for nearly 80 per cent, says Straub, is taken up in the first twenty minutes. In fact, the drug enters the circulation much faster than the water in which it is dissolved.

Elimination occurs through the kidneys by combination with glyuronic acid and for this reason it seems wise at present to avoid its use where the kidneys are damaged.

Toxicity need not be feared until about three and one-half times the therapeutic dosage is exhibited so that the latitude of safety is adequate.

The effects begin in approximately fifteen minutes after administration and last about two hours. There is no preliminary period of excitement and the awakening occurs as from normal sleep without pulmonary or cardiac complications and with no headache, depression or vomiting.

During the narcotic period, the pulse varied in our cases from two to eight beats, the blood pressure shifted from five to ten points and the respiration from two to

four excursions in observations made at intervals of fifteen minutes. None of these changes are greater than one may observe in labor from the uterine activity alone.

Preparation.—The drug is dissolved in water at a temperature of 104° F., so as to make a three per cent solution. The temperature must not rise above 104° F., or the substance will decompose and liberate dibromacetaldehyde which is markedly irritating and destructive to the rectal mucous membrane. Each application requires a fresh preparation and each preparation must be carefully tested by adding two minims of a 1:1000 solution of Congo-red to every 5 c.c. of avertin. If the color is a clear orange-red, the solution is right but if it turns blue, free hydrobromic acid is present and the mixture must be discarded.

The dose for anesthesia ranges from 0.1 grams to 0.15 grams per kilo of body weight. In our trials at the Wesley Maternity, we used only 0.05 to 0.06 grams per kilo of body weight and so obtained a narcosis rather than an anesthesia.

The administration was begun in our cases when dilatation was complete. The technic requires the introduction of a tube into the rectum above the advancing head and through this the fluid is passed to the colon. Gravity is usually sufficient if the container is high, but in some instances the head occludes the tube by pressure and a piston syringe is necessary.

In our six cases three were multiparas and three primiparas. Two of the labors were induced.

The duration of the effect in four cases averaged one hour and fifty minutes. In one case the period was four hours and thirty minutes with two injections. The results of the narcosis were excellent. No patient had any recollection of pain although in two instances a portion of the fluid was expelled.

In no instance were the contractions affected nor the evolution of the third stage influenced. In two of the labors, fifteen drops of ether were given as the head passed the perineum and in another the same amount was administered for the perineal repair.

At no time did the heart tones show anything but the usual fluctuations. Five of the babies cried lustily as soon as delivered and the sixth patient with a history of no heart tones on prenatal examination delivered a macerated fetus.

The absorption of the avertin definitely relieves the pains of labor, does not interfere with the contractions, does not pass over to the child and with ordinary care it is safe for the mother and easy to use.

CHICAGO GYNECOLOGICAL SOCIETY

MEETING OF APRIL 18, 1930

DR. IRVING F. STEIN reported a case of **Perforation of the Uterus by a Crochet Needle.**

This patient, aged forty years, consulted me on April 12, 1930, with the request that I remove a crochet needle she had inserted in her uterus. She said she had a cork on the end of it but that it had gotten out of reach. On examination, it was found that she had no fever, pulse was 100 to 108, and respirations were normal. Sedimentation test was fifty minutes. The abdomen was soft. In the right side could be felt a rather soft mass extending about 4 or 5 cm. above the symphysis. On bimanual examination, this mass seemed to be in two parts. There was a firm, round body just above the symphysis corresponding to the uterine fundus. To the right was a larger soft mass that gave the impression of being a mass of bowel

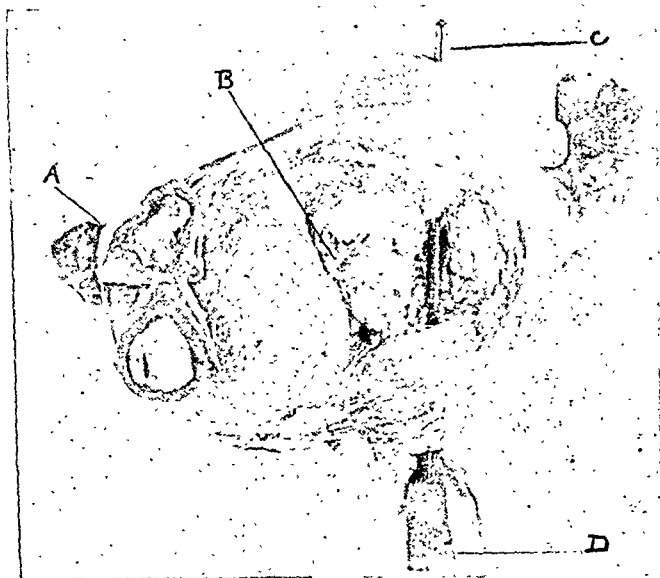


Fig. 1.—Crochet needle perforating myomatous pregnant uterus. A, True corpus luteum. B, Ovum. C, Dull end perforating fibroid in right cornu. D, Cork on sharp end in cervical canal.

or omentum adherent to the uterus. There was no evidence of peritonitis. Her last menstrual period was February 25. When she missed the March period by ten days, she inserted the crochet needle. She had during the last five years produced three abortions successfully by this method and each time was able to recover the needle. She had no symptoms as a result of the introduction of the foreign body except spotting for five days.

Just within the cervical canal one could feel a smooth object that was evidently the cork. It was deemed unwise to try to remove the needle because it was quite evident that though she had no temperature that it had perforated the uterus, and we felt it would be dangerous to pull it out of the uterus. She had been bleeding slightly for four or five days. She stated that she did not begin to bleed until she took some ergot, two days after introducing the needle. Operation was advised. An x-ray showed the foreign body in the pelvis almost reaching the iliac crest.

On opening the abdomen, we found that the uterus was myomatous and the part that extended to the left and felt like the fundus was a fibroid; though the crochet needle had perforated the uterus, handle foremost, it had gone through a fibroid, so there was no hemorrhage. The rest of the irregular enlargement was due to a six weeks' pregnancy and multiple myomas. Both ovaries were surrounded by fibrous adhesions from former ascending infection. In the posterior wall of the left broad ligament, there was a defect due to previous perforation. We removed the uterus and both ovaries. A true corpus luteum could be seen in the right ovary. Since operation her course has been uneventful. As shown in Fig. 1, the blunt end of the needle passed through the uterine cavity next to the ovum, through a myoma and protruded into the peritoneal cavity about 2 cm. A tag of omentum was adherent at the point of perforation.

DR. RUDOLPH W. HOLMES reported a case of **Ablatio Placenta.**

The patient entered Passavant Hospital at 5:00 A.M. on March 26, 1930. She was a para v, aged forty; her previous four pregnancies were uneventful; she had had such efficient prenatal care in these pregnancies that she felt that in this one she was in no need of such care, so had no medical attendant. The previous evening she experienced fetal movements for the last time; at 3:00 A.M. of the twenty-sixth she was aroused, and on arising, even though there was a light burning, she could not see clearly, had to grope her way about the room. While administering to a child her membranes ruptured. She had a distressing time reaching the hospital on account of the severe snowstorm the night before; she had to come ten miles.

On admission, the intern found the uterus very firmly contracted with almost continuous contractions; labor was progressing so rapidly that little time was available for a complete examination. I arrived at the hospital just in time to prepare my hands when the baby was born; a loop of cord was snugly about the neck and a second coil was about the body, but the first coil was easily released before the infant was born; it had been dead some hours. The cord advanced at once and the placenta was expressed by Ahlfeld maneuver. With the placenta came a black, old, firm clot, commensurate to a pint of blood. About the same amount of black, old blood came with the placenta and clot. The placenta was delivered by Duncan's mechanism; the opening in the membranes was some five inches from the placental border. On the maternal surface of the placenta there was an area of premature separation clearly marked. This area was about six inches long and two inches wide, semilunar and parallel to the placental periphery. In the twenty-three instances of ablatio placentae I have seen this is the first instance of absolute concealment of the hemorrhage until after the birth of the child. It is very exceptional for a case to present no evidences of bleeding externally from start to finish.

Immediately after the labor was completed, the bladder was catheterized, removing from 15 to 20 c.c. of very bloody urine. On centrifugalization about one-tenth of the volume was blood. There were no casts, and practically no epithelium. The centrifuged, then filtered urine, showed some albumin. Her blood pressure was 198/138; the pulse was 140. Later her blood pressure fell to 152/104, but near the exitus it rose again to 186/108. For some thirty hours she did well although some three or four hours postpartum she had a slight gush of blood, about six ounces being expelled. The uterus remained well contracted thereafter.

The day following delivery, at 3:00 P.M., she suddenly became intensely cyanotic and dyspneic. When I saw her, the pulse was galloping, convulsive in character, with a rate of 130-140. The lungs were filled with coarse rhonchi and râles, especially posteriorly. There was an apical systolic murmur. The heart was

markedly enlarged. The medical consultant declared that the whole symptom complex presaged a chronic endomyocarditis. The liver was greatly enlarged, extending downward about three inches below normal and very tender.

Eye ground examinations showed the retinæ separated, more in the left eye than the right. Punctate hemorrhages were present. Patient died March 27.

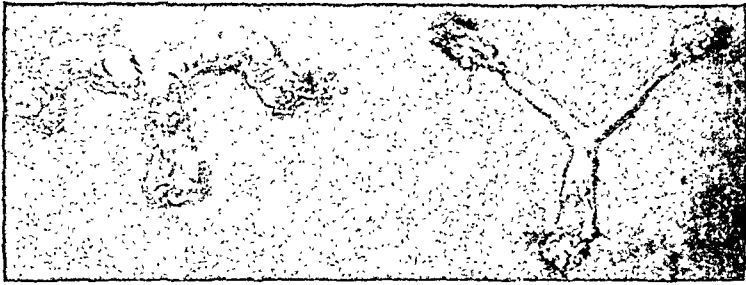
It is clearly evident that the woman had a typical example of ablatio placentæ of the absolutely concealed type. My first diagnosis was that she had the toxic type, Couvellaire's uteroplacental apoplexy, based on the high blood pressure, albumin and blood in the urine, ocular disturbance and the hepatic enlargement and a blood count of 12,280 immediately after delivery, later rising to 28,000. It is very difficult to evaluate the toxic element in this case, as the high blood pressure, liver enlargement, albuminous clear urine, ocular changes, etc., may readily be explained on the score of a chronic cardiac inflammatory process.

I do not know that anyone has accentuated the fact that high white counts in certain instances of ablatio, probably of toxic origin, are very characteristic of Couvellaire's uteroplacental apoplexy. This case contributed to the fact announced by me that my previous case, published in 1923, had a most intense infiltration of the uterus and placenta with leucocytes. It will be well to have white counts taken in all cases known or suspected of being ablatios, just as it is indispensable to have red counts and hemoglobin estimations made.

Finally, the only ultimate conclusive evidence of Couvellaire's uteroplacental apoplexy is obtained by the inspection of the uterus by cesarean section or post-mortem examination. As we now see it, such instances must have the blue-black mottlings due to massive and microscopic hemorrhages within the musculature. As a postmortem examination was not permitted, we must fall back on a tentative diagnosis of toxic ablatio placenta with ablatio retina, chronic myocarditis as secondary diagnoses.

DR. S. J. FOGELSON read a paper entitled **Changes in the Generative Tract of Female White Mice Caused by Injection of an Aqueous Placental Female Sex Hormone**, of which an abstract follows:

We had such poor results with commercial preparation in 1927 that I decided to prepare, if possible, our own ovarian hormone. The first preparations were made according to the technic of Laqueur, described in the *Lancet* in 1927, and were found surprisingly potent. It was a water soluble extract obtained from human placentas and the dosage was determined through the use of castrated mice, one mouse unit being the amount needed to produce estrus in an adult castrate. Inasmuch as the hormone was thermostable, it could readily be concentrated by boiling and this is the preparation we have used clinically. Our results are particularly interesting in view of the report by Collip in the *Canadian Medical Journal* (February, 1930). He has been able to isolate from the placenta a substance which does not produce estrus in the castrate but accelerates growth in the immature rat. I cannot say whether our preparation accelerates growth in the immature rat but am certain of its effect on the adult. It cannot only produce estrus but has in my experiments kept adult mice, normal or castrate, in continuous estrus for at least four weeks. The two mice shown were adult litter mates and the one with the extremely enlarged uterus has been kept in estrus for ten days while the normal control is going through its normal estrus cycle. The findings here are exactly similar to the first lantern slide (Fig. 2), and this result is so much like the photograph shown by Collip that they could pass for the same photograph. Figs. 3 and 4 compare the ovaries of a normal adult mouse and one which has been kept in estrus for four days. No definite marked change is obvious but I believe that there is a suggestion of an increased number of early



A.

B.

Fig. 2.—A, Photograph of ovaries, uterus and vagina of adult mouse kept in uninterrupted estrus for four days by daily injection of aqueous, placental female sex hormone. B, Normal reproductive tract from control litter of mouse shown in Fig. 2-A.

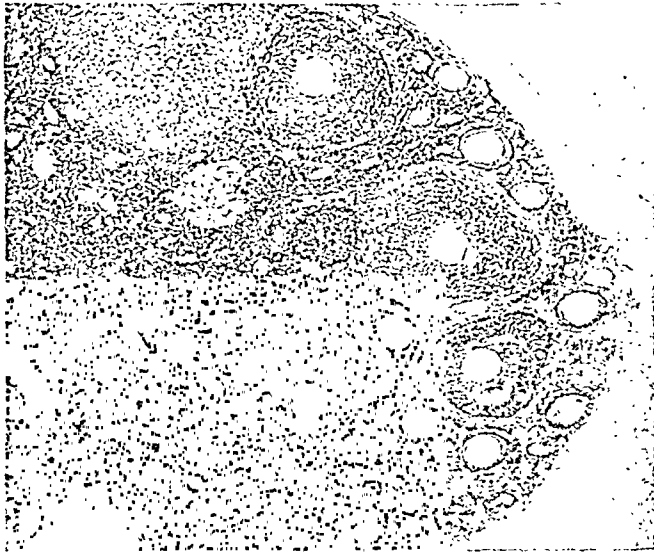


Fig. 3.—Photomicrograph $\times 80$ of normal mouse ovary.



Fig. 4.—Photomicrograph $\times 80$ of mouse kept in estrus for four days grossly shown in Fig. 2-A. Microscopically there is little definite change as contrasted to normal shown in Fig. 3.

corpora lutea. Figs. 5 and 6 contrast the uteri of the same mice, and it is quite obvious that in four days our aqueous, water soluble, placental estrus producing extract will produce a marked glandular hyperplasia or almost polypoid condition of the endometrium. At present it is impossible to say whether our preparation is a mixture of the substance isolated by Collip plus the estrus producing hormone, for he does not describe his method of preparation, and we have not tested the effect of our product on immature rats.



Fig. 5.—Photomicrograph $\times 100$ of normal endometrium of control adult mouse.

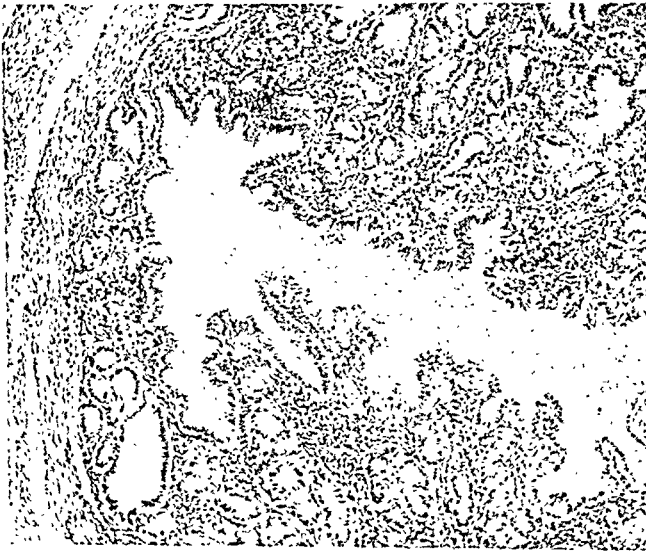


Fig. 6.—Photomicrograph $\times 80$ showing the marked hyperplasia with glandular proliferation in mouse kept in estrus for four days by the water soluble, placental female sex hormone.

DISCUSSION

DR. MARK GOLDSTINE.—This substance is very potent, as I know clinically from injecting it in young women, particularly one who has menorrhagia. I gave her ten injections and she has not menstruated since before Christmas. These

patients were bleeding irregularly and having menorrhagia and it brings them to their menopause or stops their bleeding.

Before Shaw brought out his article in 1929, I presented this group of cases before the Staff of Wesley Memorial Hospital in December, 1928, and I was waiting to follow it up with some treated cases of idiopathic hemorrhage. Clinically our substance does not bring on menstruation. I have tried that thoroughly. One girl has had over 200 injections without any menstruation, another 150.

Answering Dr. Adair's question, I do not think there is any doubt but in a certain percentage of these cases, curettage alone might stop it; I should say four or five per cent, just as it was clinically stopped before we used the hormone. Years ago, before the use of radium, we often did two or three curettages on these patients, particularly those with heart disease where the gynecologist did not want to operate. Now we can leave out x-ray, radium and surgery and stop these conditions with this treatment. On examining these curettage specimens, it is mighty hard to tell in these bleeding endometria the difference between the premenstrual endometria and some of the hyperplastic endometria. We know that these women stop bleeding because some of them were injected before curettage. There is no case included in this series of menorrhagias that did not have a diagnostic curettage, because in two cases that clinically were free from malignancy, there was great doubt as to the possibility of malignancy. They were treated as malignant cases. Every case listed in this study had a curettage to eliminate this factor.

DR. GUSTAVE KOLISCHER read a paper entitled, **Cystitis and Pyelitis in the Female.**

BALTIMORE GYNECOLOGICAL AND OBSTETRICAL SOCIETY

MEETING OF FEBRUARY 14, 1930

DR. ERASMUS H. KLOMAN presented a case of **Tuberculous Kidney With Pyelitis, Stricture and Pyonephrosis of the Opposite Kidney.**

Mrs. L. S., aged sixty-four, was admitted to the Maryland General Hospital on August 11, 1929. Her chief complaint was pain in the left side and back with nausea and vomiting. This left-sided pain dated back over a period of from twenty-five to thirty years.

The blood pressure was 125/80. There was a palpable mass in the region of the left kidney which was tender and slightly movable. Temperature 99° F.; pulse 88; respirations 22; leucocyte count 6,800; blood urea 165.8 mg. per 100 c.c.; phenolphthalein functional test 4 per cent one hour; Wassermann negative.

On August 12, the patient was extremely nauseated and vomited. There was severe pain in the left side and the patient appeared to be bordering on uremic coma. On cystoscopic examination the bladder appeared slightly inflamed. The right orifice could not be located. A No. 8 catheter, wax tip, with 3½ mm. bulb was introduced with slight difficulty into the left ureter. Urine came out under great pressure, 500 c.c. being obtained in the first twenty-five minutes and one liter was obtained in the first hour, this giving the patient great relief. A pyelogram was then made, which showed an enormously dilated pelvis of the left kidney with clubbing of the calices. The kidney was markedly enlarged and somewhat ptosed. No calculi were present. The right kidney, which was small, showed several shadows. On removing the catheter from the left there was a very definite

hang, showing a stricture at 12 and 9 cm. from the external meatus. The urine from this kidney showed red blood cells and the culture showed *B. coli*.

The patient remained comfortable for the next two days but on August 16 she had complete anuria and again suggested the picture of one bordering on uremic coma. She complained of pain in the left side, was nauseated, and vomited. The second cystoscopy revealed that the kidney had filled up again and this time two liters of urine were obtained in two hours. A differential functional test was done and again showed 4 per cent with no urine coming from the bladder representing the right kidney. The right orifice again was not located. The catheter was left in with the hope of giving continuous drainage to the left kidney which now appeared to be the only one functioning.

On August 18 the catheter came out of its own accord. The patient, however, was much better, now having a blood urea of 94 mg., normal temperature and respiration, and no nausea.

On August 19 the patient was much worse, complaining of pain, voiding scantily, and being nauseated.

On August 21 the patient was very ill with nausea and vomiting and complete anuria. She was again cystoscoped. The right orifice still remained hidden. The left side was catheterized, using a large bulb in the hope of keeping the catheter in.

On August 22 in spite of all efforts to retain the indwelling catheter, it was again pushed out and the patient immediately began to get worse.

On August 23 the catheter was again inserted, using this time a 5 mm. bulb which was introduced with some difficulty because of the strictures. The patient was immediately relieved by drainage. The catheter was fixed with adhesive tape in the hope of holding it in.

On August 24 the patient was so much improved that we felt that this was a good time to give her some permanent drainage, as we were making little headway by attempting to dilate her ureter and leaving in a retention catheter. An incision was made over the left kidney. A small buttonhole incision was made in the pelvis of this kidney. A mushroom catheter was sutured into this opening and it was drained through the left side, leaving in the ureteral catheter, which gave two-way drainage. She stood the operation very well, was sent back to her room in a very short time with a pulse of 120, temperature of 99° F, and respiration normal.

On August 25 the output was 1800 c.c., 700 through the ureter and 1100 through the pelvis of the kidney.

On August 26 the output was 1475 c.c., 600 through the ureter and 875 through the kidney catheter. The patient continued in this fashion, gradually putting out less through the kidney catheter and more through the ureteral catheter for several days. During this time she was given pelvic lavage of 1-500 silver nitrate through both catheters and the pus was gradually decreasing.

On September 6 functional test was done, resulting in 30 per cent the first half-hour and 15 per cent the second half-hour, making a total of 45 per cent as compared with 4 per cent of several weeks before. The blood urea now was 46 mg. in contrast to 165 mg. on admission. There was practically no drainage around the kidney catheter.

The patient was now thought to be improved sufficiently to allow investigation of the right kidney which was thought not to be functioning but was possibly so clogged up with stones that there might be some hope for its recovery.

Under local anesthesia the right kidney was removed. It was extremely small, hard, and functionless, and proved to be tuberculous. The patient was drained with two cigarette drains and stood the operation well.

On September 13, the kidney catheter was clamped, causing all the urine to pass through the ureteral catheter, which was still in position.

On September 16 the ureteral catheter was removed and the patient began to void normally. The ureter was then dilated on several occasions but it appeared that the long stay of the ureteral catheter had completely dilated the strictures so that now this left kidney was functioning practically normally.

On September 19 the mushroom catheter was removed from the pelvis of the kidney. There had been no drainage around the catheter and a Dakin tube was inserted.

On September 20 the patient began to sit up in bed, running a temperature of 99° F., with pulse and respirations normal. The stricture had been gradually dilated with wax bulbs ranging from 3½ mm. up to as high as 5½ mm., indicating that the ureter was dilated up to normal. The patient is now feeling better than she has for years.

On September 22 the Dakin tube was removed. The patient continued to improve. Both incisions were healed and she was up and about. Her blood pressure was now 160/72. The kidney function was 40 per cent in the first half-hour and 15 per cent in the second half-hour, making a total of 55 per cent and the cultures showed no infection. The blood urea was 36 mg., and the patient had changed completely from the picture of an extremely ill woman to one who was now very happy and well.

The patient was discharged on September 28, and I have seen her every few weeks up until the present time; she has been in excellent condition, with her remaining kidney functioning almost normally.

DISCUSSION

DR. GUY L. HUNNER.—One could not wish for a more striking demonstration of the value of ureteral stricture work than is furnished by this case of Dr. Kloman's.

By our traditional methods of at once attacking the kidney by open operation, the life of this patient might have been saved, but she would still be carrying a lumbar drainage tube, and to preserve life the nuisance of this external drainage would have to remain permanent. Through his knowledge of ureteral stricture work Dr. Kloman has been able to restore this extremely ill woman of sixty-four to a comparatively normal existence.

Dr. Howard Kelly was the first to chart the fact clearly that ureteral stricture with its consequent bad drainage is responsible for many hydronephroses and infections of the kidney, and that the proper treatment in such cases is not by direct surgical attack on the kidney but by the establishment of better ureteral drainage.

This was in 1902, and he was so far in advance of the urologic thought and practice of this day that no one gave the least attention to his prophetic vision.

In the past fifteen years we have gradually accumulated data, covering literally thousands of cases, supporting the view that ureteral stricture is the most important lesion of the urinary tract. It is the chief factor in causing many of our surgical diseases of the upper tract, and future work will show that many so-called medical renal lesions are the results of bad drainage due to stricture.

Dr. Kloman's report deals with a patient who has probably had tuberculosis of the right kidney for many years, finally leading to the destruction of that kidney. The patient came because of symptoms located in the left kidney region, with a history indicating that these symptoms were marked for the past twenty-five to thirty years.

In 1928 I presented evidence tending to show that even tuberculosis of the kidney often supervenes on the stasis and lowered resistance due to ordinary stricture, either of congenital or inflammatory origin. I reported on 15 patients who had returned months or years after the removal of a tuberculous kidney, complaining of symptoms in the remaining kidney. In two of these there was reflux of urine

from the bladder to the kidney, so I could not determine whether these ureters had been the seat of stricture, but in the other 13 cases stricture was found and the symptoms were relieved by ureteral dilatation.

These findings led to the careful investigation of all new patients having mono-lateral tuberculosis, and in all of them I have demonstrated by the bulb test and x-rays that stricture exists on the supposedly healthy side, in some instances with considerable hydronephrosis.

My interpretation of Dr. Kloman's case is, therefore, as follows: The patient probably had bilateral ureteral stricture resulting on the right side in tuberculosis and calculus formation with complete destruction but without serious symptoms. Her left-sided symptoms of thirty years' duration were probably first due to stricture resulting in hydronephrosis. Later this hydronephrosis became infected and the patient had a pyonephrosis apparently of pyogenic origin, a one-hour phthalein test of 4 per cent, and a blood nitrogen of 165 mg.

DR. M. R. ROBINSON, of New York, read by invitation a paper entitled **Primary and Secondary Ovarian Cancer, a Histogenetic, Morphologic and Clinical Study.**

DR. JOSEPH E. MOORE read a paper entitled **Syphilis and the Wassermann Reaction in the Private Practice of Obstetrics**, of which an abstract follows:

It has long been known that syphilis is a milder disease in women than in men. In the average pregnant woman with syphilis, physical examination fails to reveal any evidence of the disease. Hence, the Wassermann reaction is the best way to obtain information as to its presence and absence. The incidence of syphilis in the clientele of a number of clinics, totaling 58,000 cases, is from 3 to 23 per cent.

In contrast to the apparent beneficial effect of pregnancy on the lesions of syphilis, syphilis produces disastrous results in the outcome of pregnancy in the form of miscarriage, stillbirths, and syphilitic children. The effect of the treatment of syphilitic pregnant women on their offspring is particularly satisfactory. From the most frequent cause of fetal death, syphilis has now dropped to the least frequent.

It is a matter of surprise to the syphilologist that the average obstetrician, so convinced of the value of routine Wassermans and antisiphilitic treatment in clinic practice, is so averse to applying the same procedure in private practice. I have reviewed our own office records of private patients, and find that in ten years we have seen no less than 40 babies and children with congenital syphilis, many of whom are members of the most cultured and educated families; and not in a single instance did the mother have a Wassermann test or treatment during pregnancy. Surely the fact that a woman belongs to a family of sufficient financial prominence to entitle her to the private services of a physician during pregnancy, should not entitle her to less consideration in this respect than the charity patient.

DISCUSSION

DR. J. WHITRIDGE WILLIAMS.—I am gratified that Dr. Moore has given such prominence to our results, as I think we are entitled to the credit of having been the first to institute routine Wassermann examination in prenatal care and to have demonstrated that in many cases an amount of treatment which by no stretch of the imagination could be considered sufficient to cure the mother, will result in a normal instead of a syphilitic child. At Johns Hopkins we are now conducting a research which may possibly afford an explanation for this

phenomenon. Some time ago, I suggested that it might be advisable to determine whether or not arsenic is stored in the placentas of women receiving arsphenamine. During the past few months, Dr. Eastman of my staff has examined a number of such placentas, and in every instance has found that the placenta contained considerable quantities of arsenic for as long as six or seven weeks after the administration of the last dose of arsphenamine. Furthermore, in the last few cases, he had estimated separately the amount of arsenic contained in the villi and in the decidual layer of the placenta, respectively, and has found much larger quantities in the former. If these results are substantiated by further work, they will probably indicate that the placenta in some way has a selective attraction for arsenic, which it stores and then feeds out to the fetus, as it is needed.

I think that it is important for the younger men present to realize the very marked change which has resulted from the routine treatment of all pregnant women giving a positive Wassermann test. Up to the time this practice was inaugurated, large numbers of syphilitic babies were born on our service, and scarcely a week passed without our being able to demonstrate a syphilitic placenta. During the last few years, however, all this has changed, with the result that we now rarely see syphilitic children born to patients who have received prenatal care, and we see them only in emergency cases which have not had such care. Likewise, syphilitic placentas are now so rare as to be regarded almost as curiosities; whereas, in the past, scarcely a week passed without seeing one.

Up to the present time it has not been my practice to make routine Wassermanns upon private patients from the upper walks of life; and so far as I know, I have had no reason to regret it. On the other hand, in view of what Dr. Moore has shown, I feel that I have perhaps been negligent, and that as a matter of precaution it might be well to treat private patients just as we have treated ward patients for the past fifteen years.

Department of Maternal Welfare

CONDUCTED BY FRED L. ADAIR, M.D., CHICAGO, ILL.

A PRELIMINARY REPORT OF A STUDY OF RECORDS OF THE MATERNITY CENTER ASSOCIATION OF NEW YORK

By LOUIS I. DUBLIN,* PH.D., AND HAZEL CORBIN,† NEW YORK, N. Y.

THE following report covers a study made jointly by the Maternity Center Association and the Statistical Bureau of the Metropolitan Life Insurance Company of the records of 4,726 women cared for by the Association during the past eight years. The records studied are those of patients cared for and dismissed from January 1, 1922, to December 31, 1929, inclusive—except those dismissed because they were found to be “not pregnant,” because they were “not found” at the address given, because they “moved from the district,” or because they were “transferred to other agencies.”

PERIOD OF CARE

It is significant that during this entire period only 28 per cent of the patients came under observation before the fifth month of pregnancy; an additional 34 per cent came under care in the fifth or sixth month; and the remaining 38 per cent in the last three months of pregnancy. Two per cent actually received their first care in the ninth month. It is clear that those mothers who came to the Association for care after the seventh month of pregnancy cannot be considered as having received adequate prenatal care.

It is important to note that 85 per cent of the patients had registered before the completion of the seventh month of pregnancy. For these women a very real service, as we shall see, has been rendered, the value of the service increasing with the length of the period they were under observation.

ATTENDANT AT DELIVERY

About an equal number of the women were delivered at home and in hospitals. Of those confined in hospitals, staff physicians attended about 80 per cent, private physicians attended only 2 per cent, and the Bellevue Midwife Service 18 per cent. Deliveries in the home were made by hospital out-patient physicians in 41 per cent of the cases, by private physicians in 30 per cent, by the Bellevue Midwife Service in 15 per cent, and other midwives in nearly 14 per cent. Considering all the cases together, physicians attended slightly more than three-quarters of the cases, Bellevue Midwife Service 17 per cent and other midwives 7 per cent.

A nurse from the Association was present in the home at time of delivery in 46 per cent of all the cases attended by a physician or private midwife, the ratio varied, however, with the type of medical attendance; 64 per cent of the private physicians used the services of the Maternity Center Association's nurses, but only 46 per cent of the hospital out-patient physicians and but 6 per cent of the private midwives.

*Statistician, Metropolitan Life Insurance Co.

†Director, Maternity Center Association.

CONCRETE RESULTS

The following concrete results of these 4,726 pregnancies are worthy of attention:

1. During the entire period of eight years no woman under care died before delivery.
2. Eleven mothers died within one month after delivery from puerperal causes.
3. There were 4,596 live born babies, 123 stillbirths, and 132 of the live babies died before they were one month old.
4. There were 274 premature deliveries, 61 of which were miscarriages.

COMPLICATIONS OF PREGNANCY

One fundamental purpose of prenatal service is to conserve the health of mothers during pregnancy by keeping constant watch for the development of any symptoms that suggest conditions which may unfavorably affect their health. Albuminuria, edema, and high blood pressure are some of these symptoms.

In this group of women 15 per cent showed albuminuria, with or without some other symptom; 5 per cent had high blood pressure only; 13 per cent had some other symptoms, such as edema, elevated temperature, bleeding, etc.; while 0.8 per cent had a definite toxemia. In all, 1,604 women or one-third of the total, had one or more symptoms of abnormality, at one time or another during pregnancy. In every instance the patients were referred for medical advice or were temporarily cared for by means authorized by the Medical Board of the Association. It is of interest that not one of these women died before delivery.

These complications of pregnancy apparently play an important part in the welfare of mother and child. Among women who showed complications during pregnancy, the ratio delivered before term was 74 per 1,000, or about 50 per cent higher than among those with no complication (50 per 1,000). In the matter of stillbirths also, complications during pregnancy seem to play an important part. Among women with complications, 39 in 1,000 had stillborn babies as compared with only 19 per 1,000 among women with no complications. That is to say the chances for stillbirth are doubled when mothers have complications during pregnancy. These complications of pregnancy do not appear to have had so large an effect on the welfare of the baby during the first month of life. Twenty-nine per 1,000 of the babies whose mothers had complications died before the first month, while in the group without complications the rate was 26 per 1,000.

MATERNAL DEATHS

Thirteen of the 4,726 pregnant women died. Two died from causes other than the puerperal state, leaving 11 deaths charged to maternity. This is a rate of 2.3 per 1,000 pregnancies, equivalent to one puerperal death for every 430 pregnancies. This ratio, being based on pregnancies, is not comparable to the experience in the general population because, in the latter case, the total number of pregnancies is unknown. On the other hand, the maternal mortality rate based on live births, was 2.4 per 1,000, which may be compared with the rate of 5.3 maternal deaths among white women in New York City (1922 to 1926).

Fortunately, we are able to make comparisons with a group of mothers in the very same district, none of whom received the care of the Maternity Center Association. As data for this control group are not available for the entire eight years we have limited comparisons to the six-year period from 1923 to 1928, which is extensive enough to give reliable results. In the Bellevue-Yorkville District the mothers who did not have the care of the Maternity Center Association showed a maternal mortality rate of 6.2 or nearly three times as high as the rate for mothers who had that care. This reduction in the deaths of mothers is very gratifying and is indicative of the saving of lives that might be accomplished in

the general population were every pregnant mother to receive the benefits of a specialized maternity service.

The causes of the 11 puerperal deaths may be classified as follows:

| | |
|--|----|
| Puerperal sepsis | 4 |
| Placenta previa with hemorrhage and shock | 1 |
| Postpartum hemorrhage | 1 |
| Embolism | 1 |
| Pulmonary embolism | 1 |
| Pulmonary edema (no other data given) | 1 |
| Lobar pneumonia and premature delivery | 1 |
| Premature separation of placenta and nephritis | 1 |
| Total | 11 |

In the total of 11 fatal cases 7 mothers were under the direct supervision of the medical staffs of hospitals during pregnancy and all but one were confined in hospitals; the remaining 4 were delivered by private physicians. Only 2 of the fatal cases were primiparas, which is a slightly lower ratio than that for all cases.

Although the ratio of deaths is lower in this experience than in the general population, it is not yet as low as it should be. The 4 deaths from puerperal sepsis and the 2 from hemorrhage might possibly have been prevented, but the other 5 deaths may fall into the unpreventable group. It is gratifying that no death occurred from eclampsia, for when all is said and done, the deaths that may largely be prevented by supervision during pregnancy are those which result from the toxemias and from bleeding during pregnancy.

DEAD BABIES

There were 123 stillbirths in these 4,726 pregnancies, a rate of 26 per 1,000 births. This rate is considerably lower than is usually registered in New York City, which in 1928 was 46 per 1,000. The number of stillbirths was 42 per cent lower in the Maternity Center Association group than in the rest of the district, the rates being 27.2 as against 46.8 respectively.

Very little is known of the physiologic and pathologic conditions of the fetus and we are therefore at sea when it comes to a study of the causes of stillbirths. Many of these deaths are unavoidable, particularly those due to congenital defects, but a reduction of stillbirths has resulted from improved care of mothers during pregnancy.

Out of the total of 4,596 live born babies 132 (including 50 premature) died before they were one month old, that is, 28.7 per 1,000 live births. In New York City the rate in 1928 was 32 per 1,000. But the rate of 28.7 for the Maternity Center Association group was one-third less than the rate (42.9) for the rest of the Bellevue-Yorkville District.

The causes of death of the 82 full-term babies were:

| | |
|------------------------------------|----|
| Injuries at birth | 17 |
| Congenital malformation | 17 |
| Congenital debility | 5 |
| Diseases peculiar to early infancy | 14 |
| Pneumonia | 6 |
| Other causes | 9 |
| Not specified | 14 |
| Total | 82 |

Thus, injuries at birth and diseases peculiar to early infancy were responsible for at least 65 per cent of all these deaths.

The 50 premature babies died from the following causes:

| | |
|---|-------|
| Prematurity (no other condition stated) | 31 |
| Congenital conditions | 9 |
| Injuries at birth | 5 |
| Other causes | 5 |
| | <hr/> |
| Total | 50 |

Combining the data for the two groups, we find that over 75 per cent of the deaths of live born babies were due to obstetric or developmental causes. Little is known about preventing the developmental causes, but the total deaths can be reduced still further by continuing to improve the care of women in labor.

PREMATURITY

There were 213 premature deliveries and 61 miscarriages, a rate of 13 miscarriages in 1,000 pregnancies. We have at present no sufficiently accurate and inclusive data with which to compare this, though such as we have, indicates a saving here also.

SUMMARY

This study, therefore, demonstrates that, on the score of all essential indices, prenatal care, as conducted by the Maternity Center Association, produces effective results. The mortality of the mothers was reduced to about a third of the mortality occurring in the same area among women not receiving the intensive care offered by the Maternity Center. Stillbirths were 42 per cent lower than in the rest of the district and infant deaths in the first month of life were reduced 32 per cent as compared with the control group in the same area.

But it is only too true that in spite of the gains, the irreducible minimum has not yet been reached in the mortality of mothers, in the diminution of stillbirths or in the deaths of babies under one month. There are still too many misfortunes to mothers and babies under the present régime. A combination of such a service as the Maternity Center Association gives with a well-controlled Medical Delivery Service preferably under a hospital's supervision, would more than likely eliminate many of these misfortunes.

For the country as a whole, the results already achieved in the Maternity Center experiment reported in this study, have very definite implications. If the same type of service could be rendered universally and the same results obtained, 10,000 of the 16,500 women who die annually could be saved; many stillbirths could be prevented and some 30,000 babies that annually now die, under one month, would be living. The need of the future is obviously to put into operation the machinery which has been demonstrated over these years to be effective.

* * * *

N. B.—For the better appreciation of this report, the following brief statement of the work of the Maternity Center Association is appended.

Since 1922 the Association has been giving to the mothers under its care medical and nursing supervision, care, and instruction during pregnancy; help in arranging for delivery care; nursing assistance at time of delivery; nursing supervision, care, and instruction during the postpartum period; a postpartum medical examination, and help in arranging medical supervision for the baby and further care for the mother when necessary.

It is the policy of the Association to urge each mother to register as early as possible in pregnancy, with the doctor or hospital physician who would deliver her. All mothers are helped to select, from the medical services available in the district, the service best suited to their condition. As a result, the physician responsible for the delivery care has the advantage of first-hand knowledge of his patient's con-

dition throughout pregnancy. When, in spite of every effort of the nurse, no physician has been employed, or when the patients are to be delivered by midwives, medical supervision during pregnancy is provided through the Maternity Center Association clinics. But in either case, whether medical supervision is obtained through the clinics or from private physicians, the nurses keep in close touch with the patient over as long a period as possible during pregnancy and report their findings to the physician responsible. The nursing supervision is given partly in the home of the patient and partly at the nursing centers.

This work is done by:

1. Instructing the mothers during pregnancy in:

- (a) The mother's hygiene—nutrition, rest, exercise—and how it may be fitted into the daily régime of the home.
- (b) The preparation for the baby, including its clothes, bed, toilet supplies, and their care.
- (c) The preparation of delivery supplies and a plan for the mother's care during delivery and the lying-in period.
- (d) The care of the baby, including its bath, rest, exercise, food and daily régime in relation to the needs of the family.

2. Observing and questioning the mother to learn about symptoms and discomforts needing attention, including simple urinalysis and measuring the systolic blood pressure.

3. Studying the mother's home surroundings and family relationships so as to discover—and help to solve—any problem which in any way may disturb her peace of mind.

4. Considering the health of every member of the family—teaching the fundamentals of personal and home hygiene and arranging for health examinations, the correction of defects, the following of treatments or advice.

5. Helping the doctor or midwife during delivery.

6. Giving—or teaching some responsible person to give—the necessary care to mother and baby during the days that follow.

7. Teaching the family why a well baby needs continuous medical supervision and why a mother needs an examination by a doctor when the baby is six weeks old and helping to arrange for these and for further care when that is indicated.

8. Keeping the doctor or hospital informed by sending a detailed report of each visit including findings and advice.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Selected Abstracts

Newborn

Yagi, H.: Birth Injuries in the Newborn. Part III, Autopsy Results in Intracranial Hemorrhage. Japanese J. Obst. & Gynec. 12: 335, 1929.

In 144 consecutive autopsies, Yagi found 50 cases of intracranial hemorrhage. The importance of asphyxia neonatorum as a cause of fetal death is losing ground because in many cases of supposed asphyxia, cerebral hemorrhage is found to explain the death. Of the different kinds of hemorrhage seen, subdural hemorrhage was the most frequent (88 per cent) and then in order were leptomeningeal (26 per cent), intraventricular (18 per cent), intracerebral (10 per cent) and epidural (6 per cent). Some subdural hemorrhages are the result of rupture of the tentorium cerebelli and the falx cerebri. The author explains these hemorrhages on the basis of stasis, pressure and resistance. Two factors are important in the prophylaxis of cerebral hemorrhage. (1) Measures to prevent disturbances in the intracranial circulation produced by intrauterine suffocation, delayed labor, etc., and (2) measures to avoid compression of the cranium caused by forceps, manual extraction, etc.

J. P. GREENHILL.

Yagi, H.: Birth Injuries in the Newborn. Part IV, Mortality Statistics of the Newborn Children and Investigation of the Cause of Death Based Upon Autopsy. Japanese J. Obst. & Gynec. 12: 345, 1929.

Yagi emphasizes that intracranial hemorrhage is the most frequent cause of fetal death during labor and at autopsy it was found in 34 per cent of all fetuses examined by the author. Asphyxia and pneumonia were next in order and they accounted for 28 per cent of the cases seen at autopsy. Hemorrhage and suffocation are intimately related with the duration of labor and are greatly affected by obstetrical interventions. Hence the obstetrician should avoid delay during labor and also too frequent operative intervention.

J. P. GREENHILL.

Paddock, R.: Intracranial Injury Due to Labor. Southern M. J. 22: 130, 1929.

Fifty cases are reported of intracranial injury in viable children. Four cases involved one-sided laceration of the tentorium without hemorrhage. Forty-six cases showed intracranial lacerations without hemorrhage. Ten showed extravasation from the cerebral veins. Thirty-one had laceration and hemorrhage together, twenty of them with tentorial tears, ten with tear of tentorium and falx and one with the falx alone torn. The causes of the damage were disproportion between fetus and pelvis; inaccurate application of operative procedure; delay of operative procedure; ill advised use of pituitary extract, and rigid perineum. Careful pelvimetry and

prophylactic forceps in primiparae together with episiotomy apparently are the remedies. In breech deliveries skill in handling rather than trying to rush the infant through will prevent head injuries.

A. C. WILLIAMSON.

Yagi, H.: Birth Injuries in the Newborn. Part V, Diagnosis of Intracranial Hemorrhage in the Newborn Children by Roentgen Rays. Japanese J. Obst. & Gynec. 12: 223, 1929.

The most certain way of demonstrating intracranial hemorrhage is by autopsy. If a postmortem examination cannot be done, there are two alternatives. One is to perform a lumbar or fontanelle puncture and the other is to take an x-ray picture. Minium or barium sulphate solutions injected into the jugular veins are the best for this purpose. The author demonstrated intracranial hemorrhage in 30 newborn babies by means of taking x-ray pictures after barium sulphate was injected.

J. P. GREENHILL.

Roberts, M. H.: Intracranial Hemorrhage in the Newborn Infant as Demonstrated by the Roentgen Rays. Am. J. Dis. Child. 38: 1196, 1929.

The author attempts to improve on Schoenholtz's work who injected a red lead solution, impermeable to x-rays, into the carotid veins. Roberts used metallic mercury which he, however, injected not into the veins but into the right common carotid artery. Thus the entire arterial system becomes visualized in the x-ray picture. The article carries several illustrations showing large blobs of mercury that apparently are in the ventricles or over the hemispheres. Since intracranial hemorrhages practically always originate from veins and not from arteries, the question arises whether these blobs of mercury outside of the blood vessels shown in the author's pictures are really proof of previously injured vessels or only artifacts produced by the injection of so heavy a metal.

P. J. ZENTAY.

Schlack: Diagnostic Value of Hemorrhagic Spinal Fluid. München med. Wchnschr. 75: 1502, 1928.

Schlack presents a method of determining whether blood in the spinal fluid of a newborn child, as obtained by puncture, is due to faulty technic in puncture or to a birth trauma. The fluid is immediately centrifuged very vigorously in a narrow tube; then the upper half of the supernatant fluid is removed and the benzidine test performed. If the test is positive the blood was present before puncture; if negative, it was caused by the needle. Of 44 such examinations, 33 specimens contained blood; of these 22 were positive to this test. In 18 of these cases autopsy was done. In all the cases where a negative reaction was obtained there was no cerebral hemorrhage. In 2 of the cases where a positive reaction was found, no hemorrhages were present. The value of the test is that, when a negative result is obtained, intracranial hemorrhage can be excluded.

SHULMAN.

Bühl, J., and Weinzierl, E.: Fetal Cardiac Arrhythmia. Arch. f. Gynäk. 130: 626, 1927.

The authors lay more stress on the character of the fetal heart tones than upon their rate. A rate above 160 without a previous slowing is of no clinical importance. They hold, however, that a rate down to or below 100 indicates fetal danger from

asphyxia. The same holds true for any wide variations in fetal heart rate. Fetal heart sounds that become faint, weak or distant also indicate real danger.

The slowing of fetal heart tones may follow either the asphyxia which is produced by an excessive amount of carbon dioxide in the circulation and an insufficient amount of oxygen or brain pressure. The latter is less harmful to the fetus. Usually, however, both conditions are present at the same time.

The occurrence of fetal cardiac arrhythmias is not uncommon. The authors report three such cases. One was delivered by cesarean section and the arrhythmia, which was demonstrated after birth by means of the electrocardiograph, persisted for weeks. This was cardiac in origin. The other two cases were of unknown etiology, and persisted only for a few days. Fetal cardiac irregularity may be due, therefore, not only to intrauterine disturbances but also to inherent pathology of the fetal heart. Such a distinction is of value for, when found early in labor with slight pains, nonengagement, and therefore no cerebral pressure, etc., there is no obstetric indication for interference.

RALPH A. REIS.

Waller, B.: Our Experience with Chloroform Used to Combat Intrauterine Asphyxia. *Med. Klin.* 23: 1174, 1927.

Slowing of the fetal heart tones in utero is due to two factors, namely, interference with tissue respiration and increase in intracranial pressure with stimulation of the vagus. The beneficial effect of chloroform in the treatment of asphyxia is due to relaxation of the uterus with consequent cessation of compression of the fetal head. Chloroform also diminishes excessive tonicity of the levator ani muscles which frequently compress the fetal head. Some individuals recommend pituitrin when the fetal heart tones become irregular but this only aggravates the condition, except when the head is at the vulva.

Since May, 1924, among 4500 labors at the Prague clinic, there were 180 cases where the heart tones were irregular and in 80 of these chloroform was used. The indication for the use of chloroform was a fetal heart rate of less than 80 per minute during more than two intervals between uterine pains. In 69 per cent of the cases, the heart tones returned to normal and the babies were born alive spontaneously. In only 7.5 per cent was there a complete absence of effect and in these cases the cause of the fetal distress was not severe uterine contractions but other factors. In about half the cases where chloroform failed to act, looping of the umbilical cord was responsible for the fetal asphyxia. Not much chloroform is necessary in this form of treatment and in not a single instance was a baby harmed by the anesthetic.

J. P. GREENHILL.

Holtermann: Pathology of Overterm Pregnancy. An Early Symptom of Impending Intrauterine Death. *Zentralbl. f. Gynäk.* 53: 711, 1929.

Six cases of fetal postmaturity varying from fourteen to sixty-two days, and ending in fetal death were observed by the author. Of these 6, 5 showed no assignable cause of death at autopsy. With this as a starting point, signs of impending fetal death were searched for. In the next four cases observed, fetal arrhythmias (1 case of extrasystole, and 3 cases of slowing of fetal heart rate with irregular rhythm) were found for the first time 11, 12, 7, and 14 days respectively, beyond the expected date of delivery as calculated from the last menstrual period. Two of the mothers had previously lost 3 postmature babies and so were considered habitual. The first 3 babies of the 4 cases considered were delivered by section, and survived. The fourth baby perished two and three-fourths hours after the first appearance of an arrhythmia, before delivery was attempted. The author believes

that postmaturity up to ten days does not offer much danger to the fetus. He emphasizes that fetal death does not appear suddenly, but after definite prodromal symptoms (arrhythmias), and therefore this symptom must be considered as an early warning of impending intrauterine death of the fetus.

WILLIAM F. MENGERT.

Alexander-Katz, R.: Forensic Significance of Tentorial Tears of Newborn Infants.
Deutsche Ztschr. f. d. ges. gerichtl. Med. 8: 5, 1926.

The practical importance of the problem is clearly proved by the fact that out of 13 medicolegal autopsies of newborn babies, performed because the respective mothers were under suspicion of having killed their babies, in seven death was established as being due to hemorrhages from tentorial tears. These findings established the innocence of the accused mothers and they were immediately discharged by the court. Of importance is the further fact that in these seven instances, three of the babies were born precipitately, a type of birth well known in the causation of tentorial lacerations.

The tentorium might unintentionally be torn in rough manipulations of the head postmortem or during autopsy, but this fact is easily recognized by the absence of blood extravasation.

In infants dead from intracranial hemorrhage frequently petechial hemorrhages are seen on pleura, epicardium, on the surface of parenchymatous organs. Therefore, in all autopsies such typical findings of asphyxiation necessitate a careful examination of the cranium, since the presence of an intracranial hemorrhage will eliminate definitely the suspicion that the asphyxiation was produced by strangulation.

HUGO EHRENFEST.

Naujoks, H.: The Fate of Children Born with Intracranial Birth Injuries.
Monatsschr. f. Geburtsh. u. Gynäk. 80: 297, 1928.

According to the author the diagnosis of intracranial lesions can only be made with a certain degree of probability. Bloody cerebrospinal fluid is only one of many signs. Lumbar puncture helps only temporarily and a permanent result cannot be expected from repeated lumbar punctures. After survival, a certain proportion of babies die during the first few months or years as the direct result of cranial injuries. They may have convulsions or other illnesses which have a questionable connection with the birth hemorrhages. In a certain proportion of children, the symptoms disappear completely and the children develop normally both physically and mentally. Nine children were followed from two to twenty years. Little's disease was never encountered by the author in any of the surviving children. The author emphasizes that the hereditary factor must be taken into consideration in all of these cases.

J. P. GREENHILL.

Rydberg, E.: The Prognosis of Children Who Survive Intracranial Hemorrhages at Birth. *Acta Obst. et Gynec. Scandinavica*, 7: 323, 1928.

The author followed up 41 children who showed clinical symptoms of intracranial hemorrhage immediately after birth but who survived the acute stage of this affliction. Four children died before the age of six months. Of the remaining 37 the majority showed permanent injuries and abnormalities, and only 10 or possibly 11 are free from lesions. The remaining number show the following abnormalities: Idiots and imbeciles—14 or 15, epileptics without intelligence defects—2 or 3, paralysis without intelligence defect—1, and minor disturbances of neuro-

muscular apparatus of the eyes—7. Among the 41 children no less than 13 were delivered by means of forceps and one child which presented by the breech had an instrumental delivery. The author feels that the prognosis for children who survive intracranial birth hemorrhage must be considered "dubious but not pessimistic."

J. P. GREENHILL.

Munro, Donald: Cranial and Intracranial Damage in the Newborn. *Surg. Gynec. & Obst.* 47: 622, 1928.

The end-results of a series of 117 cases of cranial and intracranial damage in the newborn, collected and followed during the past seven years, are presented.

The diagnosis of intracranial hemorrhage of the newborn must be expanded to include cerebral edema and fracture of the skull and should be stated as "cranial and intracranial damage in the newborn." Postmortem gross and microscopic studies conducted on 45 of the 56 primarily fatal cases show that meningeal and intracortical hemorrhage, congestion and edema are the most common pathologic entities. Gross intracranial hemorrhage may occur from the rupture of any of the large venous sinuses, the most common sites being the great vein of Galen or the lateral sinus. Intracortical edema and congestion alone may cause death in the newborn.

Forty-eight of the 58 babies discharged living and relieved have been followed up to December, 1927. Thirty-nine of the 48 may be classed as cured; 5 are still too young to allow for a satisfactory estimation of the end-result.

The most common late result of cerebral damage in the newborn is hydrocephalus associated with either epilepsy or idiocy. Convulsions alone and spasticity associated with idiocy have also occurred.

Active treatment in this series was limited to lumbar decompression after recovery from surgical shock. In addition, parental blood was given intramuscularly in the hemorrhagic disease group. Depressed fractures were elevated as soon as possible. Ventricular puncture was done twice, as was a typical subtemporal decompression.

WM. C. HENSKE.

Katz, H.: Resuscitation of the Newborn. *Wien. klin. Wchnschr.* 42: 590, 1929.

Asphyxia of the newborn is the term applied simply to indicate absence of breathing. Asphyxiation is most often the result of interference in the gaseous exchange between mother and fetus before birth. Examples are cord compression, premature separation of the placenta, prolapse of the cord, and deficient oxygenation in the mother due to disease of the heart or lungs. In other cases asphyxia is caused by increased intracranial pressure due to cerebral hemorrhage as well as by drugs including the anesthetic used during delivery. These influence the respiratory center. The newborn then has the appearance of suffocation, being blue or pallid, the latter being more serious and indicating a condition such as cerebral hemorrhage.

Measures to be employed in resuscitation are: (1) The removal of fluid, blood, meconium, etc., from the mouth and throat with the finger. (2) Suction through a rubber tube introduced into the trachea. (3) Warm bath followed by cold. (4) Friction suspending the child by its feet. (5) Artificial respiration by Sylvester's method together with oxygen inhalation. (6) Flexion and extension of hips upon abdomen. (7) Ogata's method—with the spinal column of the child hyperextended the region of the heart is tapped with the hand, about 15 to 20 taps per minute, at regular intervals corresponding to inhalation and exhalation. (8) Subcutaneous

injections of lobelin, caffeine, and camphor are helpful. (9) As a last resort intra-cardiac adrenalin.

Schultze's method and mouth to mouth insufflation as well as oxygen administered through a machine are not to be recommended.

The careful execution of the above maneuvers in their order, as well as persistence as long as there is evidence of any heartbeat, is strongly stressed.

FRANK SPIELMAN.

Kobes, Rudolf: The Transmission of "Pernocton" to the Newborn. *Zentralbl. f. Gynäk.* 53: 42, 1929.

All authorities agree that Pernocton is useful as an analgesic in the parturient woman. Opinions, however, differ on the question of possible harm to the newborn child; some men recognizing none, and others recording definitely intoxicated babies of an ash-gray appearance. The author, after a six months' trial, holds the latter view. He believes that the children show symptoms of drowsiness for at least one day postpartum.

Pernocton is a brom-barbituric acid compound. Transmission of the drug to the newborn was shown by proving the presence of bromine in the fetal urine up to four days postpartum, and of barbituric acid up to three days. Bromine was found also in umbilical cord blood, and in amniotic fluid, but not in mothers' milk.

WILLIAM F. MENGERT.

Eades, M. F.: Retinal Hemorrhages in the Newborn. *New England J. Med.* 201: 151, 1929.

In this extensive study the eyes of 138 newborn infants were examined in the Boston Lying-in Hospital, mostly within the first twenty-four hours after delivery. In this latter group the incidence of retinal hemorrhages amounted to 17 per cent. Analyzing the exact obstetric history in each instance the writer arrived at the following conclusions: Operative deliveries and especially forceps play a major rôle in the causation of hemorrhages, while, at least in this series, duration of labor, time of rupture of membranes, contracted pelvis, fetal asphyxia or syphilis failed to show a primary association with the eye condition. Ophthalmologic study of the retinal hemorrhage is of no value in regard to prognosis and only of secondary diagnostic importance in relation to a concomitant intracranial injury.

EHRENFEST.

Lundquist, B.: Intrathoracic and Intra-abdominal Hemorrhages in the Newborn. *Acta Obst. et Gynec. Scandinav.* 9: 331, 1930.

The author collected 52 cases of intrathoracic and intra-abdominal hemorrhages in the newborn. Only 3 of the cases were intrathoracic of which 2 were thymic in origin and one mediastinal. Of the 49 intra-abdominal cases, 5 were due to rupture in the liver parenchyma, 14 had subcapsular hemorrhage in the liver, 17 had suprarenal hemorrhage, 1 had a rupture of the spleen and in 12 the source was unknown.

The primary etiologic factor was circulatory disturbances in the fetus as the result of labor itself and perhaps also the changes in the circulation produced by the first breath of the child. The parenchymatous ruptures in the liver and spleen may be due to mechanical injury such as direct pressure against them by the symphysis. In the case of subcapsular liver hemorrhages and bleeding into the suprarenals and thymus, there is no mechanical factor, but asphyxia is a fairly constant occurrence. Since asphyxia alone does not explain these hemorrhages, the

author assumes there is in addition a biologic basis such as a hemophilic tendency. In support of this he quotes the fact that 70 per cent of these hemorrhages occurred in male babies. Clinically the different forms of hemorrhage in the chest and abdomen are identical. Most children which survive the first 12 hours appear fairly normal for a number of days. Then they suddenly become ill and die within a few hours without presenting any local physical signs. In some cases, however, there are premonitory symptoms and a diagnosis can be made. Treatment is usually of no avail.

J. P. GREENHILL.

Goldzieher and Greenwald: Hemorrhage of Suprarenals in the Newborn Infant. *Am. J. Dis. Child.* 36: 2, 1928.

Hemorrhages into the suprarenals are commonly found in autopsies on young infants, but only in few instances of sufficient degree to account for clinical phenomena. Diagnosis of the condition during life has been reported only once before. The authors present two cases in newborn infants, diagnosed in vitam, with complete case reports, both treated with intravenous and subcutaneous injections of the cortical hormone, one case surviving.

The authors feel that suprarenal hemorrhage can be diagnosed from the following symptoms: Sudden onset of high temperature, rapid breathing, palpable tumor in the abdomen and punctiform purpuric hemorrhages of the skin or mucous membranes. Exsanguination or intestinal obstruction may justify surgical intervention; otherwise patients with symptoms of acute cortical insufficiency should be treated by continued administration of the cortical hormone.

S. E. PESETKE.

Naujoks, H.: The Etiology of Cephalhematoma. *Arch. f. Gynäk.* 136: 123, 1929.

The author attempted to produce a cephalhematoma by applying mechanical suction to an area 40 mm. in diameter on the scalp of a newborn infant which had just died. After a few moments of continuous suction there resulted a projection of the scalp over the area involved. Section through this area showed an epiperiosteal hematoma with edema of the scalp but no cephalhematoma. He then repeated the experiment with another newly born but dead infant and produced the suction hematoma on one side of the head. On the opposite side of the head he produced trauma by applying strong pressure with a blunt instrument followed by the suction. The suction alone again produced an epiperiosteal hemorrhage while the suction plus the pressure produced a cephalhematoma. The author concludes therefore that the tangential force acting on the fetal head is of primary importance in the production of the cephalhematoma. Stasis and suction are only of secondary importance.

RALPH A. REIS.

Russell, Thomas: Spontaneous Rupture of the Intestine in the Newborn. *J. A. M. A.* 90: 1431, 1928.

A careful search of the literature reveals twenty-two cases of rupture of the intestine in the newborn. In five cases the rupture occurred during intrauterine life, as evidenced by the presence of well-organized adhesions and inspissated bile. In fourteen cases rupture happened during birth, whereas in four during or soon after birth as a complication of imperforate anus or rectum. A progressive distention of the abdomen was the predominating symptom, being well marked in most cases. All cases except one were reported in the German language. All observa-

tions are based on postmortem findings. The condition probably occurs more frequently than one would suppose from the small number of cases reported, and should be recognized by the clinicians as a pathologic entity.

GROVER LIESE.

Sysak, N., and Wilfand, R.: Necrosis of the Subcutaneous Fat in the Newborn. *Med. Klin.* 23: 1452, 1927.

In recent years much has been written about a syndrome called by Bernheim-Karrer "necrosis of the subcutaneous fat in the newborn" and by Marfan "curable cutaneous induration of the newborn due to obstetrical trauma." The disease is due to birth trauma such as compression by forceps or contracted pelvis or to violent attempts at resuscitation. The clinical manifestations usually appear during the first few days of life as subcutaneous nodules or plaques of varying sizes. The skin over these nodules and plaques is red, hard, immovable and cannot be folded. These areas of hardening are found on the cheeks, the chin, the jaw, the upper extremities, the thorax, the back, the shoulders and the hips, and they disappear almost completely after an interval of time.

The authors report a case in which the symptoms appeared for the first time on the ninth day. In this case a moderate hypercholesterinemia was found (0.18 per cent). Histologic examination showed that the hard nodules were nests of lipoid-containing, pseudoxanthomatous cells of various sizes, giant cells, large fat cells and masses of calcified soaps. Many authors still consider this disease identical with scleroderma but whereas some of the clinical manifestations are similar, the histological pictures are different. Furthermore this illness has a good prognosis whereas scleroderma is not completely curable. The authors believe the cause of these hard nodules is to be found in a disturbance of cholesterol metabolism in the form of a hypercholesterinemia. They do not believe that areas of necrosis first arise and are then followed by inflammatory changes which are stimulated by the trauma of labor but they believe that in cholesterolinophile children, birth trauma acts as a stimulus to the collection of cholesterol in macrophages in the subcutaneous tissue. The authors suggest the name "subcutaneous pseudoxanthomatosis of the newborn" for the condition.

J. P. GREENHILL.

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THE LOCKYER COLLECTION of obstetric and gynaecological specimens. Housed in the Charing Cross Hospital Medical School. Catalogue prepared by Cuthbert H. J. Lockyer. John Bale, Sons & Danielson, Ltd., London, 1930.

OPERATIVE GYNECOLOGY. By Harry Sturgeon Crossen, professor of clinical gynecology, Washington University School of Medicine, etc., etc., and Robert James Crossen, instructor in clinical gynecology and obstetrics. Fourth edition, containing 1246 illustrations and 2 color plates. The C. V. Mosby Co., St. Louis, 1930.

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RECENT ADVANCES IN DISEASES OF CHILDREN. By Wilfred J. Pearson and W. G. Wyllie. Second edition. With 20 plates and 34 text-figures. Philadelphia, P. Blakiston's Son & Co., 1930.

INFANT FEEDING. By W. McKim Marriott, professor of pediatrics, Washington University School of Medicine; physician in chief, St. Louis Children's Hospital. The C. V. Mosby Company, St. Louis, 1930.

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